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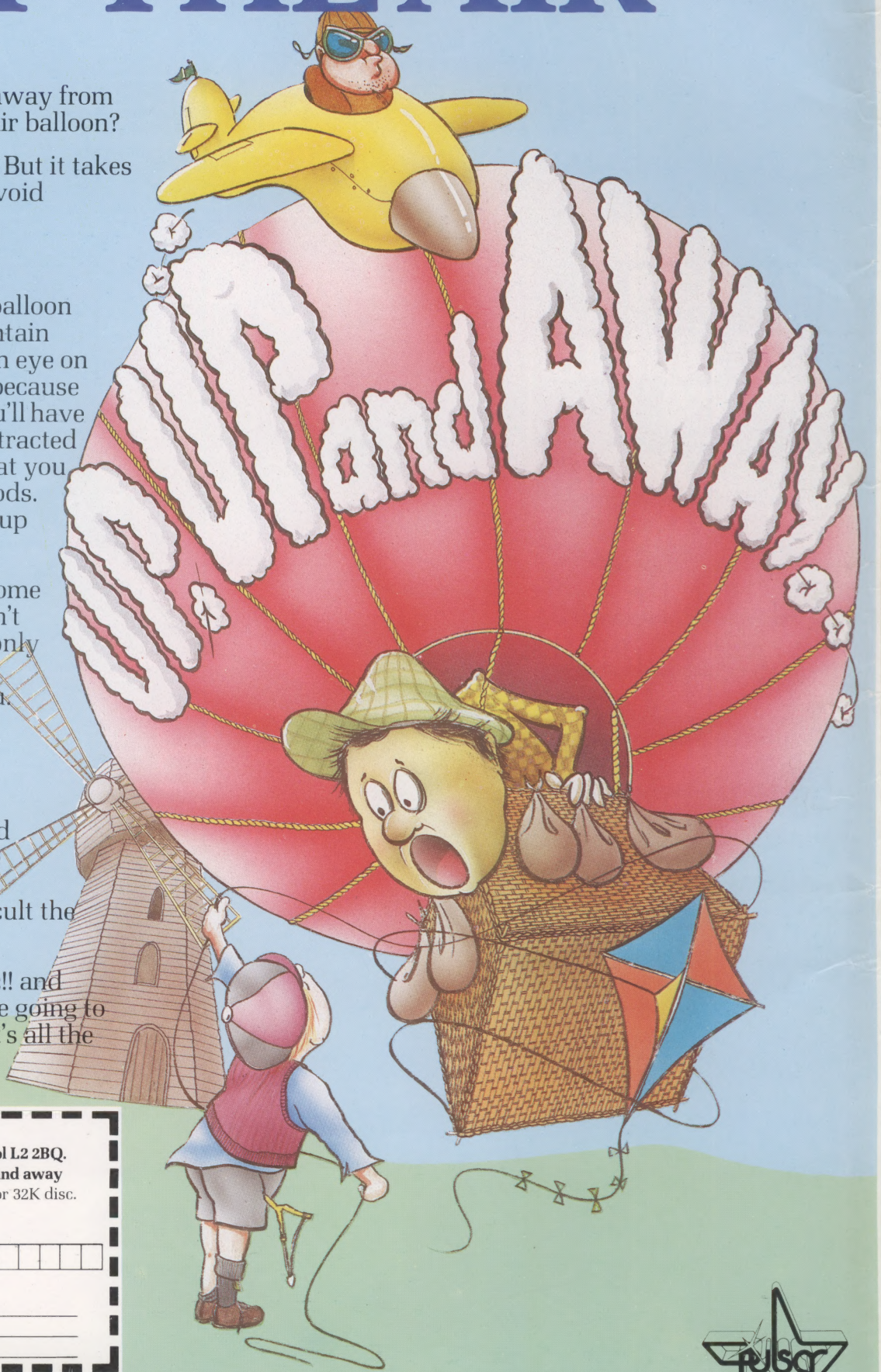

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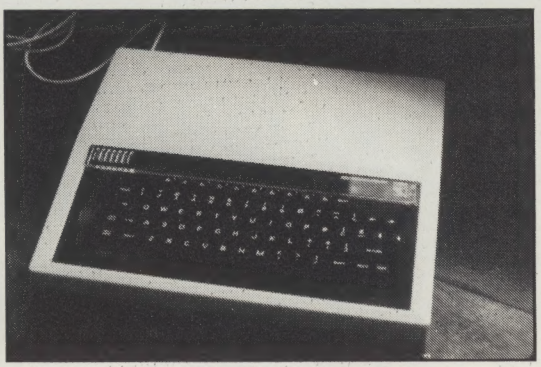

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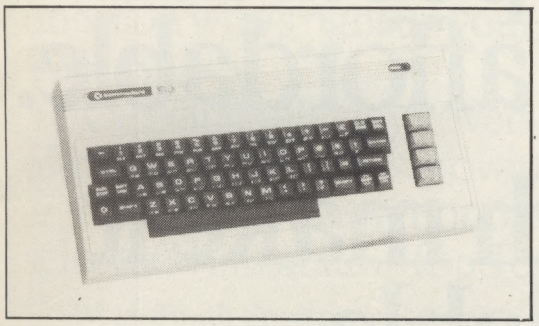

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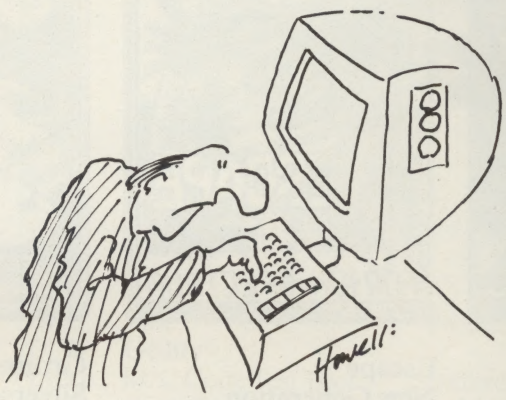

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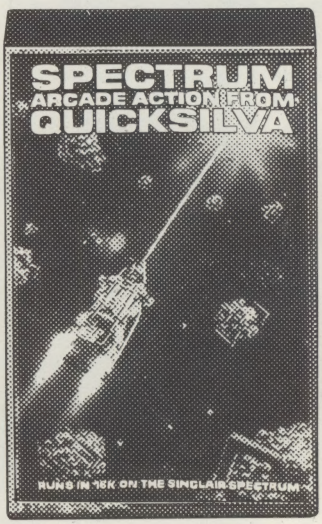

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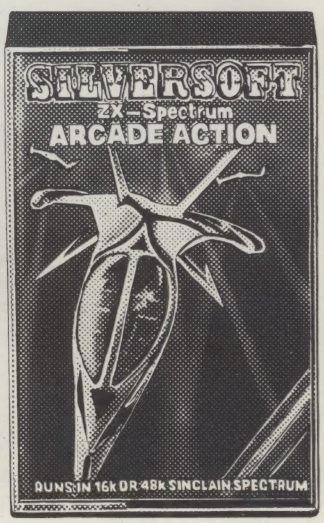

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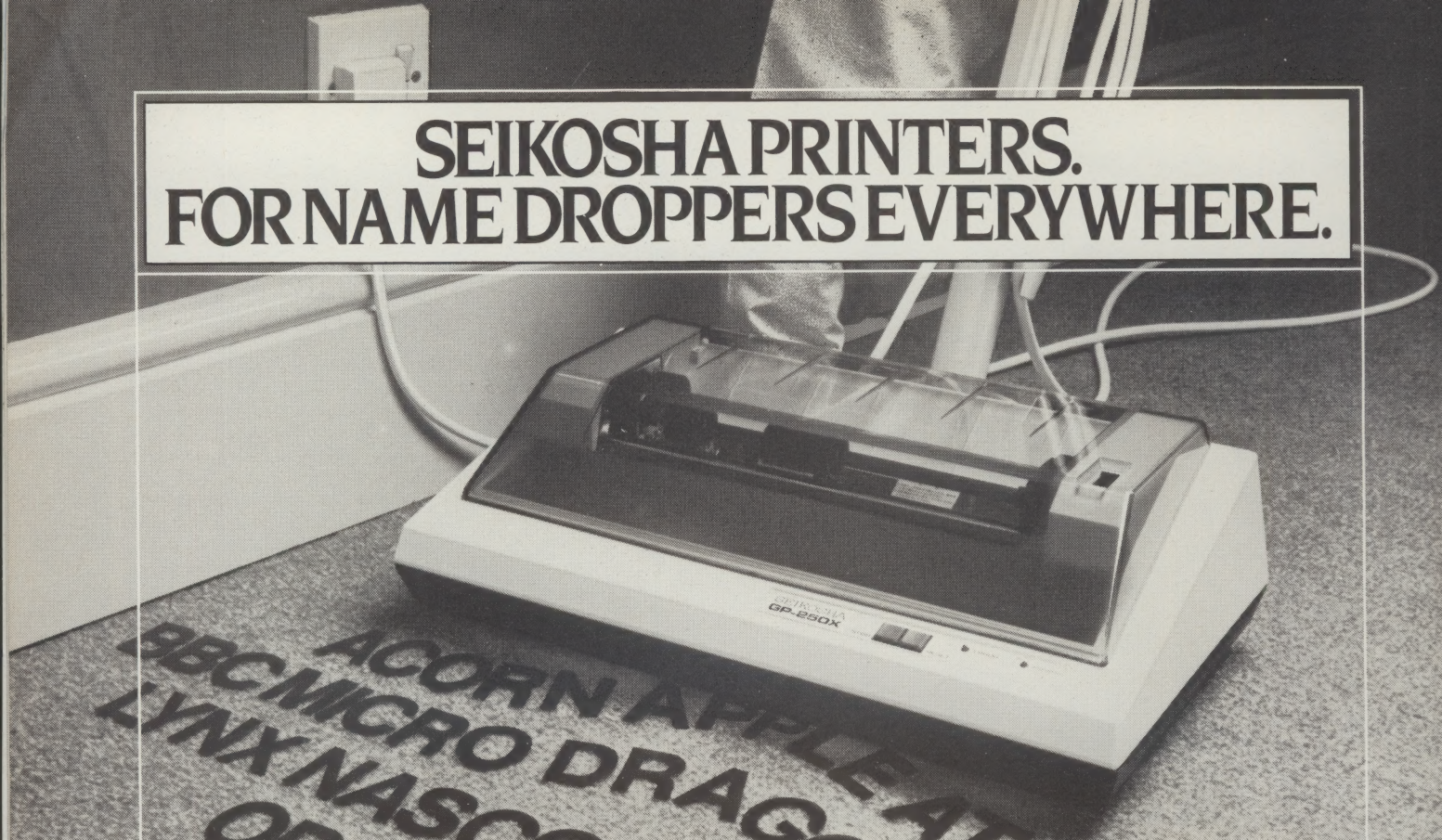

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No victors likely in price war

The latest fun game amongst computer retailers seems to be a new version of attempted suicide, for there seems to be no other logical reason for them to want to bomb the prices on computer hardware at a time when the demand for potential customers is high, and the supply situation is generally nowhere near meeting it.

A current favourite target for speculation on price cutting in the near future is Commodore, especially with the Vic-20.

There is talk amongst the dealer fraternity that May will see the price they pay for the Vic drop to under £90.

This would mean, if it happened, that the recommended 'street' price would come down to the level that some dealers are already discounting the machine for – around £120.

But this is just speculation: the more important question is whether it is actually going to happen.

At the moment, the categorical answer from Commodore is a very definite "No, only over our dead bank balance'.

From Commodore's point of view this makes considerable sense. Why on earth should it reduce its own sales revenue from the Vic-20 when it is facing enormous user demand for the machine.

Indeed, the company is noticeably embarrassed about the fact that it cannot supply enough systems to meet this demand.

But that embarrassment is not a good reason for cutting the price. In purely financial terms, it is a damned good reason for screwing the price up to the point where the demand tails off.

That is the normal economic response to be expected in such situations.

The retailers however, seem to want to do the opposite. By cutting their own margins, sometimes to the point where their profit can be measured in just a few pence per unit, they are doing themselves severe financial damage.

The only plausible excuse for such behaviour – the desire to 'buy' a significant portion of the market – is not relevant when the level of user demand is so high. There is more than enough market for everyone, and not enough product to get close to meeting it anyway.

So, the chances of the price of the Vic-20 dropping significantly in May are slight at the best. Though Commodore does admit that some 'large' retail chains have negotiated special prices for their supplies, in general there will be no change.

The one proviso in all this is the fact that the company's next quarterly marketing cycle should start about now.

This will establish the company's marketing plan – and therefore pricing plan – for half the summer. Though it is though unlikely, Commodore might just cut the price. It is not something to bank on, however.

New angle

Its not every day that we get the chance to carry out such an important road test for our readers; more often, we are confined to testing hardware or programs.

But this month we have had the opportunity to evaluate a product guaranteed to give many computer systems a lift..

That product is Hi-Stak, a system designed to raise the level of personal computing to a higher level altogether.

Hi-Stak comes from Warp Factor Eight of Ware in Hertfordshire, and is designed to elevate a wide range of personal computers.

Succinctly, it is a pair of stands that stick on the underside of a computer to jack up the back. This makes it easier to see what the hell you are doing.

Machines such as the ZX81, Spectrum, Vic 20, Jupiter Ace, Newbrain and Oric-1 can benefit from using Hi-Stak.

Extensive evaluations also showed that British Telecom's standard telephone, the shortened leg of an old office desk, and a large IBM electric typewriter also benefited from using the stands.

The stands are actually residing under the typewriter as this is being written, so of nothing else they are probably strong enough to handle most personal computers.

The price of the Hi-Stak is £3.95 including VAT, post and packing.

Commodore 64 software

Though the Commodore 64 is still something of a nearly machine – supplies to the street being a little thin on the ground at the time of writing – it seems that it will not lack for software.

Audiogenic, already a big supplier of programs for the Vic-20, is among the early runners for the 64's software market.

It has introduced a new range of programs for the machine that will be marketed under the name of Software 64.

Five programs and one language make this initial offering from Audiogenic – the language being an implementation of Forth.

This is a structured language that is gaining a large number of fans because of its flexibility and ease of use.

The programs are predominantly games, though there is also a word processing package and a Monitor program.

The WP program is Wordcraft 64, a reworked version of Wordcraft 20 written for the Vic. The Monitor is aimed at 64 users keen to delve into the realms of machine code programming.

It is transparent to other programs run on the 64, and has the added advantage of incorporating a Centronics interface.

For the games buff, Audiogenic has come up with three programs; Motor Mania, Renaissance and Grandmaster.

Motor Mania is a cross-country car race covering motorways, B-roads and dirt tracks. The screen displays full dashboard instrumentation.

For the chess freak there is Grandmaster, a program that has ten levels of play and which can be forced into making 'human errors', just to make it fairer.

Both Motor Mania and Renaissance cost £8.95 on cassette, while Grandmaster costs £17.95 in the same format.

in brief . . .

Plot or plan with grid.

Could say lots about this that might get us in trouble with the laws of libel; therefore, suffice it to say that Chartwell, the graph paper manufacturers, has launched two new stationery pads for computer users.

One is the Plotting Grid Pad, which has sheets ruled with a grid on which users can design charts, graphs and the like

prior to entering relevant instructions into the computer.

The other is the Planning Grid Pad, which has a larger-scaled grid for laying out text prior to keying in.

The pads cost £1.67 each, for 50, A4 sheets. Pads of standard graph paper can be bought for around 50p.

New centre for Stevenage.

Its certainly altruistic; it is also arguably a good way of utilising an otherwise redundant factory; but the Business and Technology Centre opened by Control Data in Stevenage is also a good idea.

People wanting to start their own small business get the chance to use the central facilities the centre offers – things like premises, heating and lighting, telephone switchboard and answering, conference facilities, and expert

advice on management, budgeting, accounting etc, and pay for it on a monthly basis.

For many small businesses, these are the factors that are usually the burden.

If you are interested in starting a new business but are scared of the long term commitment involved, this may be one avenue to pursue.

Computers get their own home

When you have spent all your ill-gotten gains on a home computer you are then left with the problem of where to put it.

Neatly avoiding all the obvious answers to this problem, most of which Lord Editor Rolington would probably end up in jail by allowing me to print, I would instead refer to you to a company called Zygon products.

It has just launched one version of the 'where' where you can put your micro. The Broxbourne, Herts-based company has produced a purpose-designed stand for home computers that should help you get rid of some of the clutter the things manage to produce.

Costing £59, plus VAT, the stand has two shelves. The top one can be used for the TV or monitor, together with the cassette recorder or disc drives. The lower one can mount the computer itself.

As an added protection for the machine, this lower shelf can be slid under the upper one so that the computer does not get hit or sat on.

As an added bit of fun, the stand comes on castors so that users can be banished to other parts of the abode, when necessary.

Word processor and calculator for HX20.

If there is one thing that will help a new machine sell, it is the availability of applications software that the users will want.

Two products that may well fit into that category for the Epson HX 20 portable computer have just been introduced.

One, Intext, comes from Talbot Offet in Bournemouth. This is a mini-word processing package which provides basic editing routines together with all the usual I/O routines such as saving, printing and the like.

In a standard Epson, files of up to 6K bytes in length can be entered before a 'Save' is required, and it is possible to interrogate the machine at any time to discover how much memory is available.

Recommended by Epson itself, the package is available at a price of £36 plus VAT.

The other program package comes from Kuma Computers in Maidenhead, which now has available Desk Master 1. This allows the HX 20 to be used in the same way as a printing calculator.

In addition it incorporates such functions as adding time and date to printouts, calculating to 16 digits, and providing a number of options on the arithmetic provided.

When not in immediate use, this £29.50 package acts as a clock/calendar.

Space Trek for Dragon

A game with a wonderful mathematical anomaly is one of several programs, introduced by Trojan Products, for the Dragon 32.

The game in question is Space Trek which, according to the blurb, takes place in a 10 x 10 galaxy. This contains the mathematical impossibility of having 100 quadrants.

It is also played in real-time which, when time in space is only relative, could prove to be difficult.

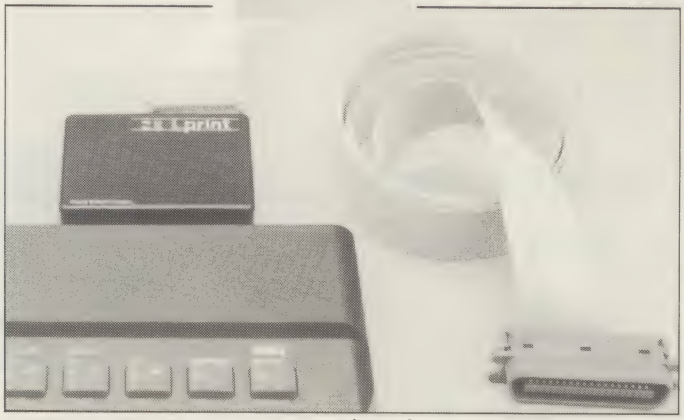
Costing £7.50, it involves the player in beating up enemy space ships before being made non-combatant by dint of depleted energy resources, or being blasted around the heavens.

The other programs are Reversi, which is a version of Othello, which costs £5.50, and The Trojan Light Pen. This £10 pack plugs into the joystick port and comes with a cassette demonstration program.

Printer range for Spectrum

A good example of David pushing Goliath about is the thought of a Sinclair ZX Spectrum driving a big daisy wheel printer. There is, of course absolutely no reason why a Spectrum shouldn't be used to perform this feat, and a lot of reasons why some owners would be happy to be able to do it.

Now they can, for a company called Euroelectronics has produced a parallel Centronics interface for the Spectrum, so that it can be used to drive most of the dot matrix or daisy wheel printers available on the market.

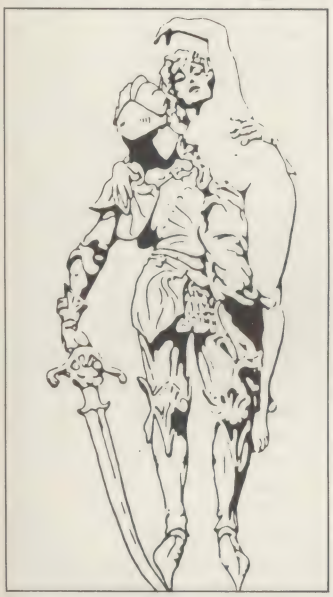


Called ZX Print, it plugs directly into the rear connector of the Spectrum, and has a ribbon cable to connect it to the printer.

In addition to dot matrix and daisy wheel printers, the interface can also connect the Spectrum to a high resolution graphics printer.

Here, the screen contents can be dumped to the printer using a COPY program that is available on cassette.

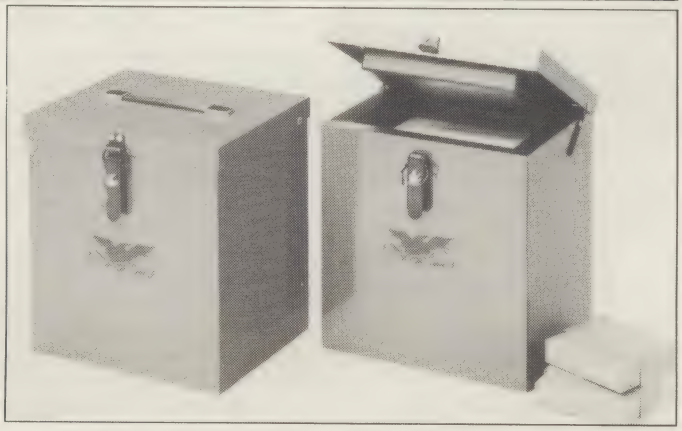
Unsuitable logo



Here's a good example of . . . well . . . tackiness.

This is the logo used by an Ipswich-based software company called Microtek, and it depicts a naked girl being clasped by a person wearing, of all things, a suit of armour. It also bears the legend "Where Software Meets Hardware".

This probably wins some sort of prize, perhaps not disimilar to a can opener . . .



Hot box for cool discs

Hundreds of puns and witicisims spring to mind about this item, but I shall avoid them, for it is in the end a subject about which it is better to be sober and serious, for it is the subject of fire.

Action Computer Supplies has produced a fire resistant box called Mediaguard which does just that: protects floppy disc media from the ravages of fire.

At £249 it is not cheap, but then, neither is the data that some small businesses (and even some home users) are now keeping on their discs. Protection seems a sensible precaution.

It uses a patented, asbestos-free insulation material to provide protection to BS 476 standards.

This involves subjecting the box to an ambient temperature rising to a maximum of 943.3°C over an hour. It is then hosed down to cool.

The temperature inside the box on test stayed below 50°C during this time, and the media kept inside was fully readable afterwards.

The box is capable of holding up to 80, minifloppies, or 30, eight-inch boxed discs.

Education from Acorn

Five new educational program packs from the pens of Russell and Ann Wills, have been launched byn Acornsoft.

Word Sequencing and Sentence Sequencing test students comprehension of English by presenting a jumbled screenful of either words or sentence that have to be formed up into something coherent.

Word Hunt provides four programs that each contain a list of nine words.

Number Balance is a pictorial program where students input missing numbers in one side of an equation to produce a level balance.

They are available, together with 'teacher notes', for £11.90 in cassette form, or £15.35 in disc form.

in brief . . .

Casing the BBC micro

Naked BBC micros shouldn't be allowed except in the privacy of one's home. They should certainly never be seen in public in a state of undress.

This, at least is the view of one dealer of the machine, Scunthorpe-based CFL. Having seen many owners indecently exposing their machines on the way to user club meetings, the shock company has decided to act, by designing and manufacturing a carrying case for the machine.

It will cost BBC owners £22 plus VAT to protect the virtue of their machines using the case, which is made by someone with the improbable name of Handsome Henry.

Given a time of two weeks, and the financial inducement of between £20 and £50, the company claims it can now produce a carrying case for most machines.

Printers are always a useful item to have around if you want to take your personal computing seriously, and one of the companies that has made quite a name for itself as the provider of low-cost units is Epson. Now the company has two more printers available.

These are the FX80 Versatile printer, and the RX80 Personal Printer. The FX80 can print any character that can be defined within an 11x9 matrix.

This is achieved by storing the user-defined character in 256-character store in the unit, which is additional to the machines standard character set.

The RX80 has two 96-character ASCII sets and a print speed of 100 characters per second.

Vic 20 Choplifter

The game that allows players to prove that they are better than the US marines at rescuing people in tight spots – Choplifter – has not become available in Vic 20 format from Audiogenic.

American troops tried this game for real not too long ago, out in the Middle East. They lost.

Choplifter comes from Broderbund Software, and is already available for the Atari range. Supplied in a Vic-compatible cartridge, it costs £24.95.

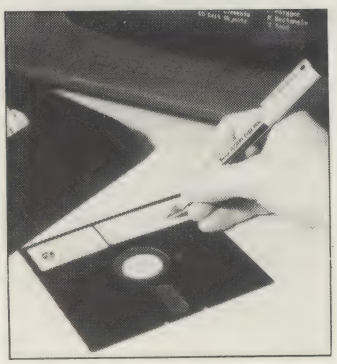
in brief...

Floppy pen for discs

What-will-they-think-of-next-department: a pen specially made to write on floppy discs. Ah ha, I hear you say, 'tis magnetics, not ink that is used to write upon a floppy, so why have a pen?

The answer is that a pen is needed to write just what on earth it contains on the label of the disc; and even though a floppy disc comes with its own protective cover, it is quite easy to damage the surface of the disc when writing on the label in a, well, indelicate manner.

So, the pen-makers, Berol, have come up with what it believes is the solution to this



problem, a pen where the tip gives way if the writing pressure gets too heavy.

The idea is that the bent nib can then easily be straightened out again. It will be interesting to see whether those that are heavy-handed enough to bend the nib, then have sufficient manual dexterity to straighten it out again.

Four colours are available: black, blue, green and red, and they have a recommended retail price of 45p.

CP/M on cassette

If you have ever felt the need for someone to tell you what CP/M is all about then perhaps Head-Line Communications may be of service, for the company has produced an audio cassette training aid that sets out to do just that.

Called 'Using Your CP/M Micro', the two cassettes which make up the aid come with complete reference manuals and check list. With all this, it should be possible for the novice initiate to CP/M – to learn how to implement some of the inner mysteries on their computer.

Micro discs — which size will win?

One aspect of personal computer technology that has stayed relative constant over the last few years has been the floppy disc drive. The standard has been the 5¼ inch unit, and this has become the staple diet of most computer manufacturers.

That standard is about to be threatened by moves from the drive manufacturers to shrink the size of their products.

The trouble with this is that, unlike the standardisation that has happened with the 5¼ format, the new micro discs are currently being specified in two different formats, each with its own proponents and critics.

The two different formats are 3½ inch diameter and 3¼ inch diameter. Both aim to pack around half a megabyte of storage on a single sided disc.

There, however, any hint of similarity, let alone compatibility, ends. And with that ending comes the possibility of future aggravation for some micro owners.

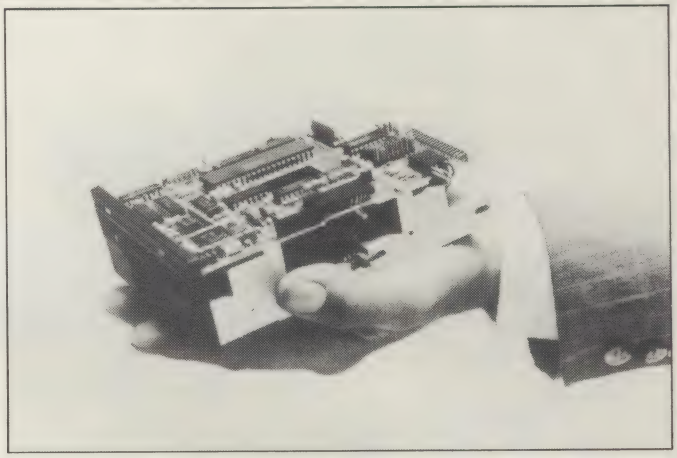
The 3½ inch disc format has attracted the most interest from the existing disc manufacturers. Thirteen of them recently agreed to support a mutually compatible standard format.

This will give system makers a wide range of alternative sources of supply – an essential feature of the manufacturing business in high volume products like personal computers.

The thirteen are Atari, Athana, BASF, Fuji, Memorex, Media Systems Technology, Shugart Associates, Sony, TDK, 3M, Verbatim, Wabash and Xidex.

The specification they have agreed upon includes discs that have 80 tracks per side at a track density of 135 tracks per inch. The disc will come in a hard cover for protection.

The 3¼ inch diameter format has amongst its proponents Seagates. This company has recently taken out a licence to manufacture the drive system developed by Tabor Corporation of Massachusetts.



With this format, the disc will also have 80 tracks per side, but a density of 140 tracks per inch.

This disc will come in a soft paper sleeve like current floppies.

It is almost inevitable that, with a new development like the micro disc, there should be a certain amount of rivalry between competing techniques. Sometimes however, the poor users can end up the losers while the flak is still flying.

It would be advantageous from everyone's point of view if one of these formats could emerge as the standard, as happened with the 5¼ inch drives. Then confidence can be built up in the current availability, and long term future for the discs.

Some systems manufacturers, and therefore some users could be left holding an awkward baby if and/or when one of these two formats loses out in the standardisation race.

Only those manufacturers with a base of installed systems big enough to provide some insurance cover can ignore the need to choose one or the other.

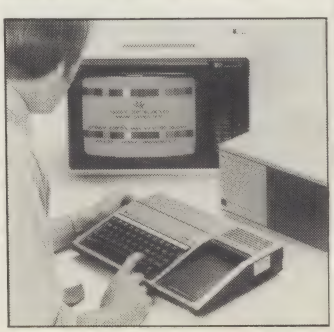
The obvious contender in this particular race is, of course, Sinclair Research. Not untypically, the company is doing its own thing in the micro disk product arena.

As a final thought on the subject of small disc storage systems, things seem to be happening in the area of hard disc drives as well. This month is expected to see the introduction of a 3.5 inch hard disc system that should pack around 5M bytes of formatted data.

The manufacturer will be Control Data Corp, better known for its large disc systems for mainframe computers.

TI transformer safe

Some owners of the TI99/4A may have been wondering just how safe their machine is, following reports from the dear old US of A that owners there had been getting a buzz from their systems.



According to the company in Europe, the version of the 99/4A sold here, or more specifcally the power transformer used with the machine here, is perfectly safe, and there is no danger of getting an electric shock.

The fears about the European version stem from the fact that US owners have received shocks from the transformer.

The US version is made by a supplier in Mexico, and a batch were discovered (the unfortunate way) to be faulty.

The European transformer does not contain the fault, TI states.

Tandy's new micro trio

Watch out for new machines to pop out of the Tandy hat during the coming months. The company is planning its response to the current crop of new machines from other makers, and is scheduling the introduction of three new computers.

The three will give Tandy additional products in areas of the market where it has already been active.

Other companies have come along to join them more recently and now it is gearing itself up to have a go at the latest competition.

The first system scheduled to appear, in June, will be the Model 4, which is aimed at the lower end of the small business market.

This machine is expected to have a 128K byte internal memory, dual floppy drives offering around 1 M byte, and a built-in interface to a Winchester hard disc system.

Pricing looks like being aggressive, with a fully configured machine, incorporating screen and keyboard, expected to cost around £1700.

It is expected to have a considerable amount of software available at the time of launch, which means that it will be compatible with existing Tandy business systems.

The next machine to appear, somewhere in the July/August time frame, will be the Model 100.

This is intended to give Tandy a place in the new but growing market for small portable systems, typified by the likes of the Epson HX-20.

The final member of the trio is not expected to appear in this country until the end of the year, and at present there is not too much known about it.

The aim, however is that the new machine, to be built in South Korea, will be a replacement for the company's existing Colour Computer.
sit, alone with your computer and your nakedness, no doubt wondering 'what happens now?'

This game has a final irony (well, its ironic to me at least). The program, if you will pardon the expression, only comes as a 5¼ inch floppy.... Flaccidware rules, OK?

Flaccidware for the UK

The latest jargon word to appear in the USA, according to sources close to the country, is Flaccidware. It would seem to fit, both emotionally and chronologically, after software, firmware, and hardware.

It refers, post operatively if nothing else, to the latest trendy rage in US personal computing software – Pornography.

Using the ever-improving graphics capabilities of home computers to maximum advantage (or disadvantage) US software writers are producing programs that are supposed to titilate the user (or not, as the case may be).

For example, Which Micro recently gave a brief review of a program called *Strip Poker* and ....well.

I am inclined towards a natural negative bias against such things anyway. They are, at best, tacky and boring, even when they come as books or magazines. Fantasies about two-dimensional naked ladies aren't really my bag.

But interactive games programs of that ilk seem to me considerably odder, and more disturbing. The promotional leaflet sent out with one game even shows a man sitting in front of a tv obviously losing. He must be losing because he's taking his clothes off.

So why are, in my own humble opinion, programs like Strip Poker tacky? Well, for a start in this peculiar game the graphics is of a lady (I use the word advisedly). In fact it is of one of two ladies. One is Melissa, who is a skilled poker player, and the other Suzi, who isn't. Depending on whether you are feeling macho or wimpish you can choose which (I refuse to say 'who') you play.

Obviously, one has to be a pretty poor specimen to lose against Suzi, and making full use of the graphics of your machine, she soon left with nothing. The trouble is, so are you.

Melissa is far more dangerous, or odd, or both. It is obviously a higher standard poker-playing program, for you stand a good chance of losing. Then it is you who will

One hand shooting

Do you find that the joystick provided with your personal computer maybe doesn't have the same response as your favourite arcade game? Either it somehow isn't fast enough or the degree of control has not been that good.

If that is the case then you could be interested in a new joystick called the Quick-Shot, an American implement that is now available here through Vulcan Electronics of Hendon.

The main advantage is that it is a one-handed joystick, allowing players to control and fire single-handed.

Indeed, the firing button gives a rapid fire capability for greater playing speed.

Of course, this may not suit the more cautious players, so it also has a normal 'second' firing button on the base of the unit.

To really make sure it is one-handed, the joystick comes fitted with four suction pads to stick to any flat surface.

It is available for use with the Vic-20, Vic-64 and the Atari 400 and 800 systems, and costs £11.95

in brief...

Apple mother board

The companies either in, or thinking about the OEM business using the Apple II as the host computer, there is now a compatible mother board system available from a UK company, U-Microcomputers.

It has produced the U-Com2 board in response to a perceived demand for a board level system that is fully Apple II compatible.

It hopes to take the business where some OEMs have reportedly bought Apples, stripped out the processor board, and thrown the rest away.

The board comes with 64K bytes of RAM, eight expansion slots, and a keyboard socket amongst other features, and is compatible with the Apple bus architecture.

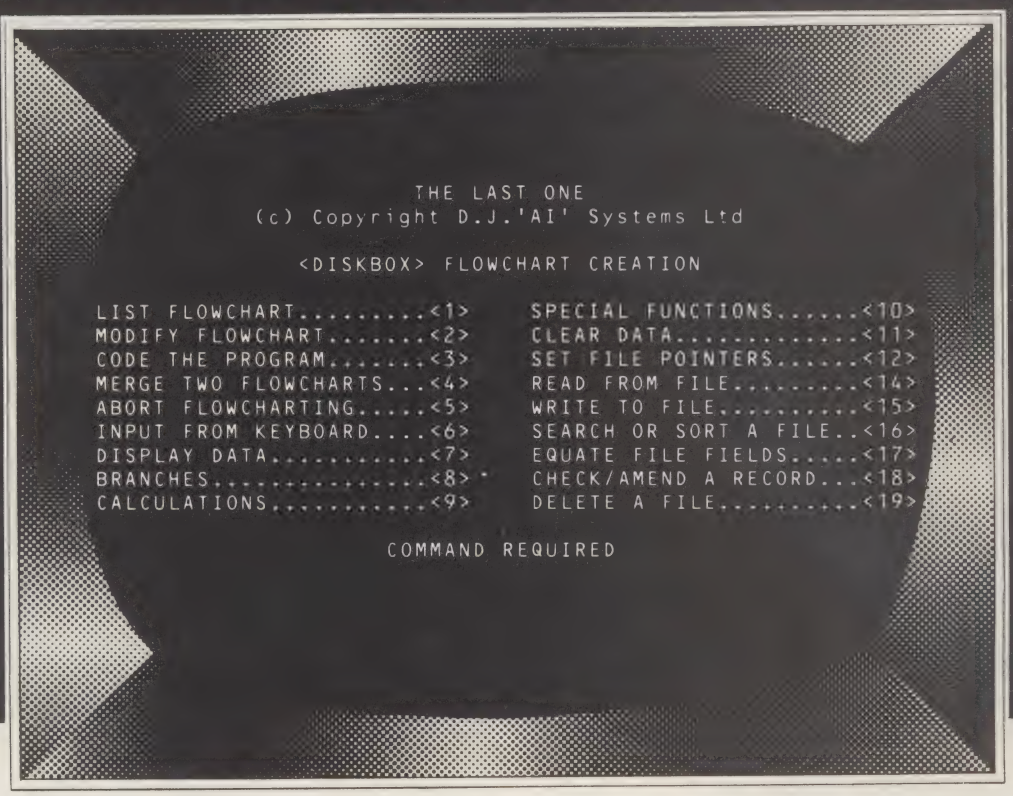
This makes it compatible with several other machines, besides the Apple II, including the Franklin Ace, ITT 2020? Basis 108 and Pearcome machines.

Sirius users club

Luton-based Sirius dealer, The Microsystems Centre, has launched a Users Club for owners of the 16-bit machine.

The company hopes to create a forum for owners to express their views, complaints and wishes about the machine's hardware, software and support, as well as it being a source of pooled experience and expertise.

Interested Sirius owners can contact the company at Enterprise House, 7-7A Gordon Street, Luton, Beds. Tel: 0582 412215.



Program coding is now as easy as 1,2,3...

It's not writing programs that takes the time, it's coding them – every comma, bracket and filename has to be exactly right, just one of those obscure symbols adrift is enough to crash the biggest, toughest program in town!

How much easier it would be to say "Search that file" and "Display Fred's record" instead of having to write a dozen or more lines of faultless BASIC whenever you want to find something. Well, now you can.

The menu shown above is one of the central screen displays in **THE LAST ONE**. By combining any of the options shown it is possible to create simple or complex programs with no more than a few, carefully selected, keystrokes. **THE LAST ONE** does the rest, only asking you to answer its questions from time to time so that it can be sure that the program it is writing does exactly what you want. And all this in (more or less) plain English.

Now you can design, write, amend (and sell!) perfect customised programs without ever typing a line of code. A godsend for the business micro user, a phenomenally powerful tool for the professional programmer, a delight to all; **THE LAST ONE** allows anyone to write computer programs.

Finished programs can handle up to 15 files simultaneously (9 on the Commodore machines), they can include *any* feature found in *any* application program you've ever seen, and they run first time – every time. Following a year of extensive field trials, **THE LAST ONE** has grown from a simple (though advanced) program generator into the one of the most powerful micro tools available. It is in use in thousands of installations around the world including banks, airlines and scientific and educational establishments as well as being available on countless small business machines.

THE LAST ONE runs on the APPLE II, the COMMODORE 4032 and 8032/96, the TRS-80 Model II (TRSDOS or CP/M), most CP/M, CPM-86 and MS-DOS machines including the IBM PC and the SIRIUS.

Whatever you use your computer for, you owe it to yourself to find out what **THE LAST ONE** can do for you – to see it in action. To order or to find out more, write to:

D.J.'AI' Systems Ltd, Station Road, Ilminster, Somerset, TA19 9BQ

Telephone: Ilminster (04605) 4117

THE LAST ONE™

Nominated 'SOFTWARE PRODUCT OF THE YEAR 1982', and selected as finalist in Recognition of Information Technology Achievement Awards (RITA).

AMERICAN REPORT...

Micros have been described as personal, home, desktop and portable but now there are also lap computers says Deborah Wise.

Americans are good at thinking up ways for consumers to use new products. I mean, who in the world wanted a computer at their fingertips five years ago?

With persuasion, demonstration and, of course, clever marketing came acceptance.

It started with the personal or home computer, the name dreamed up for a frustratingly difficult-to-use machine that made young Californian men extremely wealthy and destroyed personal and family relationships across the western world.

Then came the desktop computer which made the young men wealthier and scared the living daylights out of business people to whose desks it was headed.

The portable computer followed shortly after bringing the office closer to home, at the risk of a hernia, and now there's . . . the lap computer.

No, it's not the bright idea of a marketing man stumped to find a new place for consumers to put a computer now that the living room table, the den's desk and possibly even the kitchen counter are filled.

Lap computers do sit nicely on two uncrossed knees: they don't require you to balance a hefty monitor on your toes because there's a built in display; and you don't have to trail an electrical tail – they run off batteries.

Epson makes one, the HX 20, NEC has one too, the PC 8201 (but it is not saying when it will be released outside of Japan) and Radio Shack is about to announce its Japanese-made model shortly.

They cost from $700 to $1300. Perhaps another bandwagon is beginning to roll.

For the moment, however, they all come from Japan. And when I think of lap pets from the east, I conjure up horror stories of Pekes and Chihuahua nipping off my fingers before I can administer even a friendly pat.

Is the HX20 a Peke in disguise? Or the PC 8201 an attempt to replace my cuddly cat with a snipping chow?

Frivolity aside, do I, or anybody else for that matter, need a lap computer?

Perhaps. their value lies in convenience. They have enough internal memory to write several pages. The chips use CMOS technology (complementary metal-oxided semiconductor) which means they require less power than typical Ram chips and can store information internally even when the power is turned off.

Lap computers will most likely come with some general application software in read only memory. The NEC computer and the up coming Radio Shack model have a simple to use cut and paste type text editor. There's also a built-in Basic (from Microsoft).

A typical liquid crystal display area shows eight-lines by 40 columns. This is adequate for making notes and even sufficient for short letters and memos.

Yes, I am in favor of the little gadgets even if it means taking up more of my personal (computer) space which is now crowding up with desktop and home models.

The true portability and the functions make the lap computer a delightful alternative to the backbreaking Osbornes of this world. (Speaking of Osborne, two new models are scheduled to be roled out this spring. More on that next month).

Having finished my eulogy to compact science let me broaden my discussion with news of a 22M version of the IBM Personal Computer.

Just when you thought you could take delivery of an ordinary PC, IBM has introduced an element of choice. (But who needs 22M in a single user system?)

With superior wisdom, gained from looking a the explosive growth in the IBM PC add-on market, IBM has brought out an IBM PC with its own hard disk and expansion module.

The IBM Personal Computer XT (for extended and not extraterrestrial – even IBM is short of that type of communications for the moment), has a built-in 10M hard disk and one 360K floppy. Add to that a newly announced expansion unit with a second 10M hard disk and floppy drive and you get the 22M single user version.

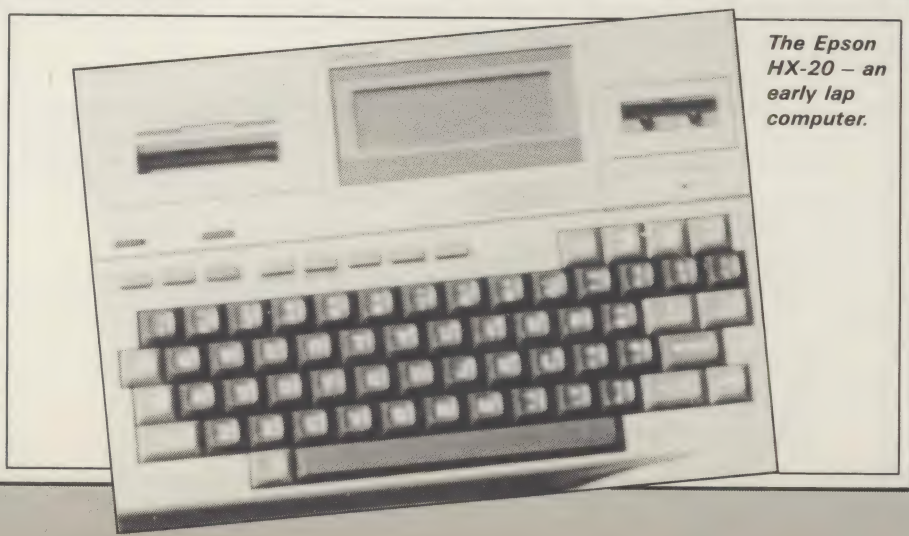
The XT uses the same Intel 8088 microprocessor as the original PC but has an upgraded version of the DOS operating system that takes advantage of the hard disk. There's now a hierachical file structure and the ability to do one task in the foreground while printing in the background.

The XT has three more expansion slots than the original PC. The 10M expansion box also has an additional eight expansion slots. IBM has built one of these for the original PC too.

Prices for the original product were decreased by between 13% and 20% and the XT model came in at about $1000 above those new prices.

Third party developers of hard disk peripherals for the IBM PC were not delighted with IBM's muscling in on their market; but they did like the idea of the extra expansion slots – more room to plug in specialized, multi-function boards, you see.

And that's it for now. I hope all those programmers and systems designers who were hatching projects last winter will come out of hibernation soon to liven up the computer scene here. Rumour has it . . . but I shouldn't spread rumours. Perhaps next month.■



The Epson HX-20 – an early lap computer.

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Good news for 64 owners. We've got two great arcade games for the 64 with several others almost ready. **TANK ATAK** is a free adaptation of the Battlezone arcade game, but **MANGROVE** is a totally new idea — and a very addictive one at that. Your task is to mastermind the survival of primitive cells in constant danger from malignant microbes; their life is in your hands! These games are written entirely in machine code with colour graphics and sound; they cost just £8 plus VAT each.

BUSICALC is a simple program that could save you hours of calculation and re-calculation, whether you're balancing a household budget or doing forward planning for ICI. It has been described as the poor man's **VISICALC**, but in fact it does one or two very useful things that **VISICALC** won't do. See the review in February's Which Micro, or phone for further details. **BUSICALC** costs £39 plus VAT on tape, £40.50 plus VAT on disk; it's available now for PET (40 or 80 column), VIC-20 (with 16k expansion), and Commodore 64. Also available soon for the BBC 32k.

THE HITCH-HIKER'S GUIDE TO THE GALAXY is an adventure program based on the popular book and TV series. Like all real adventure games it is entirely textual, so if your brain can't handle anything more complicated than Space Invaders you'd better think again. Hundreds of **PET** owners have enjoyed this great game, and now it's also available for the Commodore 64, BBC 32K, and Dragon at a new low price of £12 plus VAT (£13.50 on disk).

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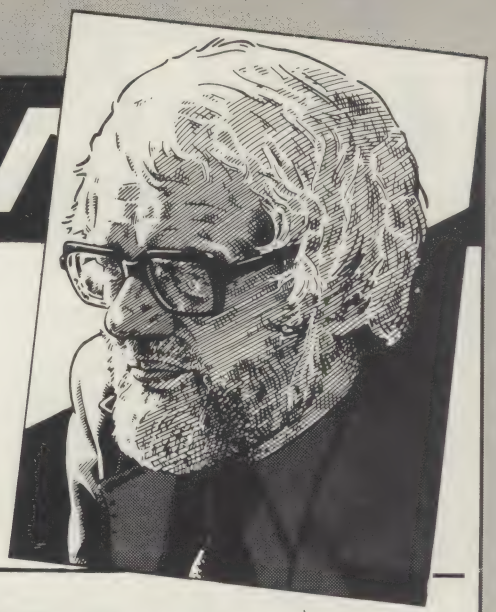


Letters to: **Hedley Voysey** *(above), EMAP Computer Publications,* **Which Micro & Software Review,** *Scriptor Court, 155 Farringdon Road, London EC1R 3AD.*

Swopping discs

What are the general problems in exchanging discs with other users?
P. Spencer, Manchester.

There are separate problems in reading and writing. For instance, the new Mark 2 version of the Osborne 1 is able to read several popular formats, such as Xerox, the IBM PC and at least one Digital Equipment format (the VT 100) but it will not write discs for these machines, so restricting the interchange possibilities.

The position is likely to get worse as the hard cased small floppies emerge on to the market, unless the standards used are truly interchangeable at the disc format level.

The new drives for the Apple range which use a higher capacity (nearly 900K) and the Sirius drives which run to 600K both exploit special features which make exchange with other systems impossible without deliberately building a system to act as an interchange.

There is a healthy market for service firms able to read discs in one format and produce copies for another format.

There is incidentally, no hope that the Sinclair microdrives will be compatible with anything else, but it would be pleasant to be proved wrong for a change.

One or two floppies

The expense of systems having two floppy disc units puts me off buying my own micro. Is there any point in buying a system with just one floppy and a cassette for holding valuable programs?
John Denham, Aldershot.

The gain made in turning to a floppy is that access to what is stored there is much quicker because the serial searching is largely done away with.

However, if you are not playing games, or just doing very small jobs of input and output, you really need a second floppy.

For instance, just by creating good copies of programs on blank discs you protect yourself from many aspects of corruption that occurs with heavily used material, whether data or programs.

You will notice that a dual floppy system and a basic printer generally add up to the major part of a complete system.

One of the reasons for the popularity of the Osborne 1 is that it includes dual discs and really needs only a printer to start work. That is quite apart from having useful software included in the price.

The twin disc systems are fairly essential to create a usable operating system, which in turn is what makes available a wider range of adaptable software.

CP/M crudity

I am not an experienced computer user but I have used systems attached to large minicomputers. In examining a personal micro using CP/M I find I am appalled by the way it seems to work, or the things it does not do.

Should I wait for better things to come along, or should I get used to CP/M?
Simon Walker, Liverpool.

First, some parts of CP/M are being extended, especially to match the more powerful machines now becoming available. For instance, some multiple tasking and processing aspects are being covered in 'concurrent' and 'MP' labelled versions of the system.

However, basically, the standard CP/M exists to handle a single user doing a single task at a single keyboard. It is a low overhead system which is very portable.

It is thought that about 500 to 800 kinds of micro systems have been kitted out with CP/M. That is longer than the listings at the back of the book.

It is hardly to be doubted that Unix variants will come to be preferred for the 'supermicro' systems rolling down the aisles of the future. If you become used to CP/M then it is easy to fudge Unix to look like it in terms of commands entered on the keyboard.

What cannot be done is to dress up CP/M to pretend to be Unix – except in limited ways. The crudity of CP/M starts with the single level of files.

Then it is stuck with a fairly brutish 'command processor', however, this matches most basic personal machines and their uses – we had to start somewhere simple.

Then CP/M is moulded to fit a small set of input and output gadgets some of which are physically stuck to the operating system, while others are more elegantly referred to as logical entities.

All that irritates in CP/M can mostly be related to a rather restricted horizon in imagining what personal computing is all about.

8 bit expansion

I was struck by the statement that the maximum capacity of an 8-bit processor is 64K bytes of RAM. If so – what is the implication of expansion beyond this figure?

I should add that I have a yen to write engineering programs involving matrices and am still feeling my way to grasping the capacity involved.
J. Wiseman, Hatfield.

The statement that struck you is terse, valid and yet thoroughly misleading. It is that pretty typical of life?

The natural number of bits available for addresses in an 8-bit micro lends itself to counting up to the 64kilobyte range in binary – that is just over 65000 in decimal, just as your five fingers cope happily with counting from 0 to 31.

If you check this you will realise that 16 bit control registers are commonly used.

But, by splitting data and programs you can generally achieve a fairly painless doubling effect and the Z80 has an inbuilt feature to do this.

In any event, board designers with almost all micros can add 'banks' of 64 kilobytes to be addressed in turn. This is rather like using a shift key on a typewriter.

This is how features can be added via a control box to address a megabyte, say, as is done with some micros.

There is also the method which treats extra RAM as instantly accessible floppy disk space, that is as a peripheral via the normal operating system calls to diskettes.

This technique involves remembering that what enters from the sham floppy will be 'overlayed' on to real main store.

Lastly, if you are grappling with matrices then examine whether they are 'dense' or 'sparse'. If the latter then many of the 'zeros' can be squeezed out by compression coding.

However, reinflation must take place before much work is done on them. It is an interesting topic.

Letters
TO THE EDITOR

Which Micro & Software Review,
155 Farringdon Rd., London EC1.

User group?

If there is anybody out there who owns or uses an Epson HX-20 for whatever purpose and would like to share their ideas, or help others to realise the full potential of their machine, contact me.

When doing so, please enclose your name and address, what you use the machine for and your occupation.

If you also have any ideas on what you would like the "HX-20 Users Group" to do for you then also include that.

HX-20 Users Group
c/o 14 Courtleigh Gardens
London NW11 9JX

Keyboard woes

This is in reply to F. Gomez's letter in your February issue of Which Micro? stating that he was having problems obtaining his goods ordered for Fuller Micro.

In late November we ordered a ZX81, keyboard and 16K Ram pack from Fuller. Our cheque was duly cashed on 1st December, but no order was forthcoming.

After Christmas I telephoned to be told that the computer had been sent in early December.

The company said they would check with the Post Office and send another which, it claimed it did.

No computer arrived and after at least eight telephone calls, I managed to speak to the manager, Mr. Backhouse, who confirmed that no computers have been sent as they were awaiting a delivery from Sinclair.

We decided to ask for our money back and were told to apply in writing. After three weeks still no reply so more telephoning and no success.

Luckily my brother has his main office in Liverpool so armed with briefcase and bowler hat he went to act on our behalf.

I think they had the impression that he was in a legal capacity.

However, it worked and he was given a cheque (£1 less than we paid) and with trepidation banked it and waited for it to "bounce"; miraculously it didn't and now we're off to choose another computer.

I might add that the firm operates from three very small rooms in a "seedy" tenement block near Liverpool city centre.

I am quite convinced that without the help of my brother we would still be waiting. It will be a long time before I feel confident to send "cash with order please".

Wishing F. Gomez commiserations and success.

Mrs. G. Pederick, Bristol.

Texas users

I today saw a copy of your magazine Which Micro? & Software Review, March issue.

I have been a member of the national user group TIHOME (for the T199/4A) for some months and I am at present trying to start a local user group in Coventry.

I would be very grateful if you could include my intentions to start a local group for the T199/4A.

T199/4A (COVENTRY)
45 Seagrave Road
Coventry
West Midlands CV1 2AB
Phone: 23011
Contact: Mr. N.C. Clemons

BBC group

The Liverpool BBC & Atom Group now meets twice monthly:

1) First Wednesday of month Old Swan Tech. College Room C33, 7:30-9:30.

2) Third Thursday of month 1st Floor, Science & Maths Dept. 7:30-9.15pm.

Birkenhead Tech. College

For more information, plus news of meetings, please contact the Secretary, Nik Kelly, 051-525 2934.

ZX TV grumbles

I must take issue with you regarding the last paragraph of your reply to F.W. Jeffery (March issue) re his query about suitable tv's for the Spectrum.

Uncle Clive's young lady told me that Hitachi, Grundig and Toshiba were all unsuitable (pity it isn't mentioned in the adverts).

I have a Hitachi CPT 2210 which is perfect except for one thing – the colours when using it with the Spectrum are pretty awful!

My local Smith's use a GEC for demo purposes which seems OK.

Morals – (1) do not believe the man in Smith's when he tells you that any tv will do, and (2) don't buy a Spectrum if you have any of the 3 types mentioned above.

Unless of course Mr. Jeffery and myself both have faulty Spectrums.

Does anyone out there use a "blacklisted" tv successfully?

Ian Whiscombe
Winchester

Binatone query

On page 122 of the February issue of Which Micro it was stated that news about the Binatone computer would be given in the March issue.

I bought this copy but could not find any information whatsoever.

Please could you send me (or tell me where I could obtain) some information about it, as I am interested in buying one.

William Mitchell
South Shields, Tyne & Wear

'News' about the Binatone computer has been coming for ages, but at the time of going to press all we can say is "no news".

As soon as we get any definite news, we'll let you know.

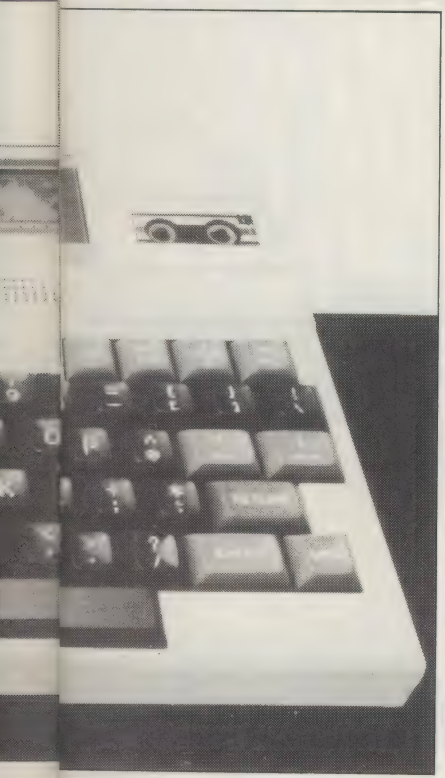
No Oric yet?

Please can you help me!

You advertise the ORIC-1 16K RAM computer, price £99.95 in your magazine as having a 28 day delivery date. But . . .

On the 24th November 1982, I sent an order to ORIC complete with cheque for £105.90 for an ORIC-1 computer, believing it would be delivered to me within the 28 days, which meant I should have it in time for Christmas (it was to have been a present).

When I received their receipt of payment on the 28th November, I was



Calling all HX-20 users.

disappointed that the delivery date was later than I expected, but I thought it was only 2 weeks to Christmas and I could wait.

When it hadn't arrived I rang ORIC and was promised delivery by the last week in January. It didn't come, so I wrote explaining everything to the manager but I didn't even get a reply.

I ran again at the beginning of February and was told it would definitely be delivered during this week – as the week is now almost over I am getting really worried.

Will you please look into this for me, as they have had my £105.90 now for 3 months.

I have made 3 expensive telephone calls to them in London and I still haven't had any satisfaction from them.
J. Birkett
Darlington,
Co. Durham.

We contacted Tangerine Computers on your behalf, and were told that although there have been production difficulties with the 16K Oric, the 48K version is immediately available.

Consequently, anyone experiencing long delays in delivery of their 16K computer can expect to receive a 48K model, with the option of exchanging it or paying the difference when the 16K Oric finally appears.

Ripe Apples

I have been waiting for the revised Apple II and I now find it will cost more to buy than the older model which is on offer to me at a good price.

Would the IIe be worth the extra?
Bernard Hull,
Coventry.

It depends a bit on whether the difference would be better spent on some other portion of your personal computer development.

If you are planning to do extensive word processing or other extended use of the keyboard, then the new machine really is better and worth the money.

If you know enough about the software you are going to use, or develop, then you will also be able to judge whether the extra main store is likely to prove an asset early on.

Otherwise we would plump for the cheapest to get you started, especially since the Apple has a good reputation and holds its price quite well. But remember, the new keyboard is an improvement.

Hot memory

I have a Sinclair ZX 81 with added 16K Ram pack. I find that my program frequently disappears while in use though the memory is not overloaded.

This happens most usually after the machine has been in use for an hour or more. The memory pack is taped to the machine and I do not think the fault is due to movement.

Could I obviate movement problems? Could it be that the problem is due to overheating or some other cause?
J.R. Oaten, Ashford.

A flexible connector for about £10 will obviate movement problems. This has appropriate plugs and sockets and a ribbon cable linkage. The Sinclair mounting is not all that bad however.

Some memories do give rise to overheating effects. Try borrowing a fan and blowing air across the unit.

If this cures the problem then it may be necessary to get rid of the heat by inserting a good metallic conductor to shift it away from the pack.

The alternative approach is to stop the heat reaching the processor box where the heat is causing the cut-out problem. This is the reverse of the first approach.

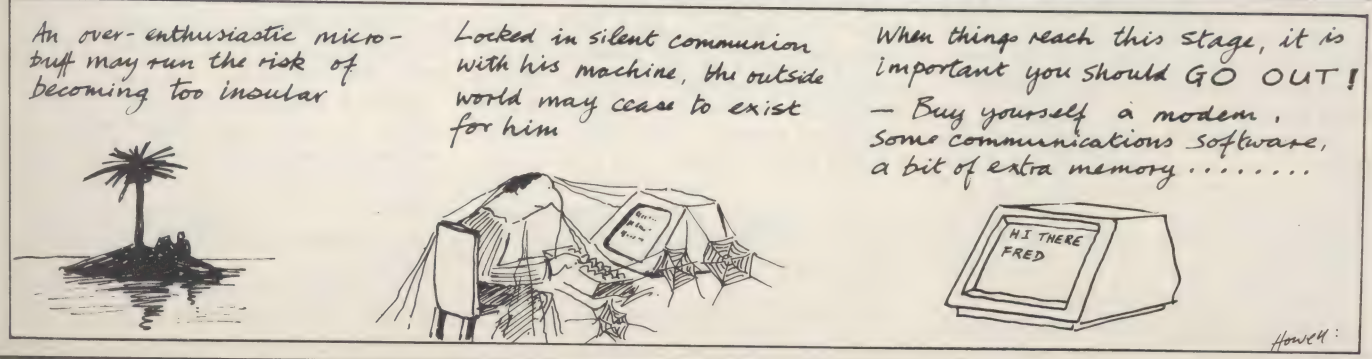
But, it is also possible that mains spikes are creating the wipe-out effects. We have known of personal computer users who are sitting up late getting this trouble as the TV stations close down and people move off to bed, throwing a few mains switches as they go and letting spikes flip around the mains circuits.

Simple spikes can be controlled by filters for about £10 or so, although more extensive mains controllers will cost as much as the Sinclair itself.

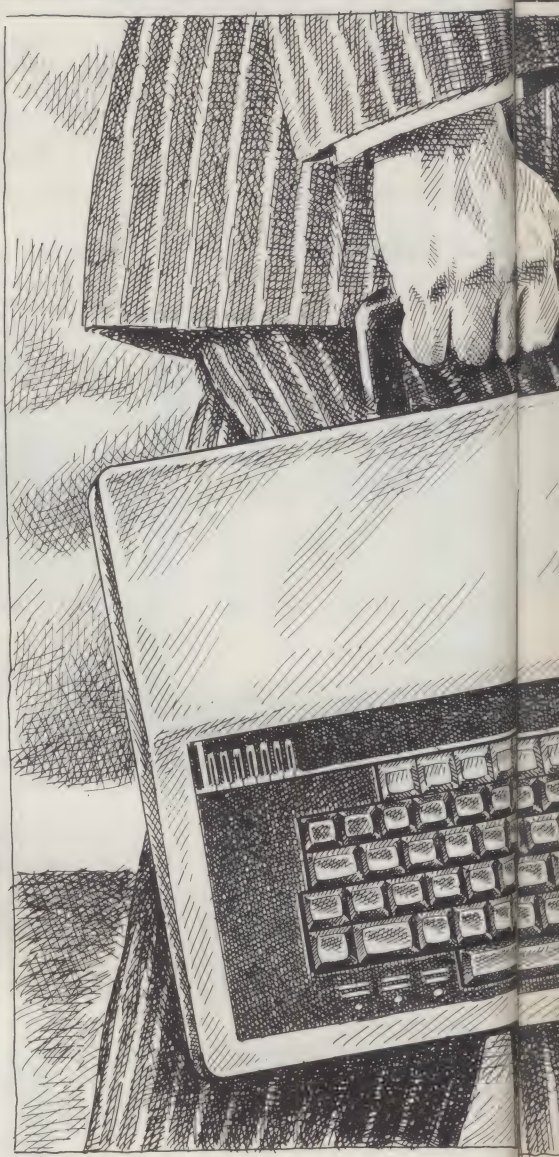
SILICON TIPS

Handy Hints for Micro Users

By Richard Howell



BBC CAN IT WORK IN BUSINESS



Here we offer some advice on using this powerful micro for small scale business use

Not long ago, if you asked most micro owners what serious uses they had for their machines, they would have been hard pushed to find and answer.

But things are changing!

A large proportion of the computer-buying public are beginning to realise the possibilities offered by the current generation of micros.

They want to go beyond playing games and learning how to program by purchasing a machine which can bridge the gap between home and office use at a reasonable price.

Fortunately the micro manufacturers have woken up to this shift in demand, and are starting to design cost effective units which are unable to perform the functions of a games or hobbyist's computer, but can operate equally well as a small-scale business machine.

Developing the trends set by the Apple II and the larger PET's, micros like the Commodore 64 and Acorn's BBC computer now follow a design philosophy where the machine has good games potential, but is also the first step in a complete business set-up.

The BBC Micro is particularly suited to this sort of expansion, with its planned Teletext and Prestel adaptors and Second Processor add-ons. It also has excellent graphics and sound capabilities, several screen display modes and a reasonable keyboard action.

The 32k Model B also comes equipped with a large number of interfaces. These include parallel and RS 423 serial connections, a 1 Mhz bus, analogue-to-digital converters and the 'Tube' for linking up with the Second Processors.

BBC Basic supports advanced features for structured programming like the definition of procedures and functions, IF.. THEN.. ELSE and REPEAT.. UNTIL loops.

The 16k operating system is very extensive, but on a sour note it has been the source of some discontent to buyers of the machine. Even after a year of production the provisional 0.1 operating system is still fitted to most people's BBC Micros.

The latest 1.2 version is required for the use of disc drives, plug-in programs in ROM form, the Second Processors and two-way data transfer via the RS 423 port.

Anyone ordering hardware or plug-in ROMs from Acorn which require '1.2' will be supplied with an upgrade operating system free of charge, but the rest of us will have to wait, amd may have to pay for the privilege.

Uses in the Home and Business

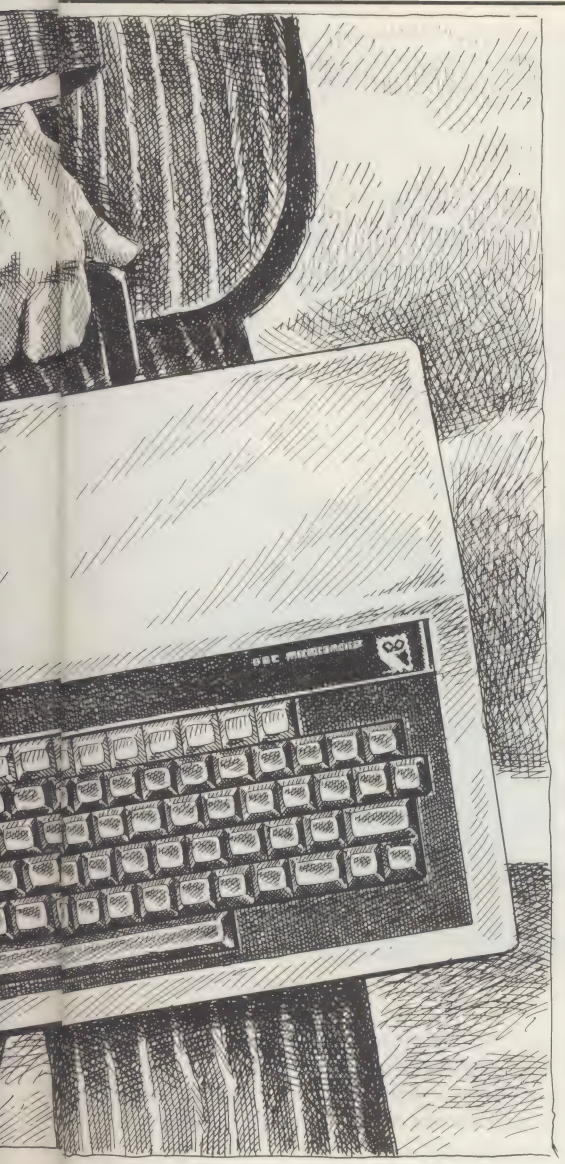
The first steps away from games playing on an advanced home micro like the BBC Model B will probably involve programs for home finance, invoices, mailing lists and word processing of documents and letters.

A database may be useful for small-scale accounting, insurance records and catalogues.

The minimum set-up to carry out these activities would be a micro, printer, VDU or television set and either a cassette machine for program and data storage or, more sensibly, one or more disc drives.

Such a system would undoubtedly appeal to the writer, shop-keeper or self-employed person with work to do at home, and by careful choice of the components, could form the basis of quite a powerful set-up for a small business.

A dual disc drive would be a necessity though, if more advanced payroll or



stock control programs were to be run.

Printers

A printer is usually the first major addition to a home computer set-up, after the micro itself and a cassette recorder for saving and loading programs. A dot-matrix printer is a good choice for versatility, often having the advantage of a variety of different print styles and sizes, and being good value for money when compared with a "letter quality" daisy-wheel printer.

Many are able to cope with high-resolution graphics dumped from the micro's screen display, if a suitable program is bough for around £5.

The BBC Model B can be used with a number of makes of dot-matrix printer (including Seikosha, Centronics and Epson) as it has both parallel and RS232-compatible serial interfaces.

Prices for matrix printers vary between £250 and £400, while the letter quality daisy-wheels start at about £500, putting them out of reach of most home users' budgets.

The Epson MX80 III is not the cheapest of the dot-matrix variety, but it interfaces readily with the BBC Micro's parallel output, provided that a suitable cable is bought for around £15.

The MX80 will print either 80 or 132 characters per line, and has several type-faces which are sufficiently near to letter quality to be acceptable for most purposes.

A tractor feed is standard, suiting fan-fold paper, but there is a friction feed option which allows the use of headed notepaper in single sheets.

Visual Display Units

Micro owners who grow tired of wrestling with the family for the use of the T.V. set will probably end up buying a monochrome or colour monitor specifically for use with their computers.

The BBC Model B will provide an RGB output to drive colour monitors (giving an excellent colour picture without interference) or a 'composite' monochrome video signal via a BNC socket at the back of the machine.

It is possible to modify the video output to give colour, but the P.A.L. colour information added will generate annoying patterns when used with a monochrome monitor.

If a lot of work is to be done at the VDU, it is certainly worth getting the best one possible. When using the 80 character per line ability of the Model B with a domestic television the blurred image via the UHF converter can be extremely tiring to watch.

The answer is to obtain a high-definition monitor which can handle the tiny detail originated by the BBC Micro.

Buying a T.V. monitor is like buying hi-fi. Each gives a different result, and if in doubt it is best to try the set with your computer before buying it. As a general rule, acceptable picture definition will be obtained on monitors having a video bandwidth, or frequency response, of 10Mhz or greater.

Be warned though.

That figure will only be achieved in the centre of the screen – the picture always deteriorates towards the edges!

A green-screen monochrome monitor could be useful if a lot of word processing is to be done, as the phosphor in the tube is slow to lose its brightness between successive 'frames' of the picture compared with a standard black and white tube.

Disc Drives

Disc drives used with the BBC Micro are typically about 60 times faster than using cassettes, making them essential if large amounts of filing or word processing are to be undertaken.

The first step when fitting discs to the machine is to have the disc operating system (d.o.s.) installed. The task is fairly complex, and should normally be carried out by Acorn or a qualified dealer.

If you can afford it, it is best to order the d.o.s. when buying the micro from Acorn's subsidiary Vector Marketing, as charges for the upgrade at a dealer's can vary from £75 to £100.

An added advantage is that the computer is then bound to arrive fitted with the rare 1.2 operating system!

Despite vague rumours from Acorn, it is not absolutely necessary to buy one of their drives for the BBC machine. Various sorts of disc drive will work with the BBC Micro, although not all come with the vital utilities disc and handbook for the system.

BBC-compatible disc drives are now available from a number of souces, including Microware, Microage, Cumana, Mole Computer Products and of course Acorn.

As an example, Cumana's 100k single sided drive has its own power supply and costs £199 + VAT, but it comes without the utilities disc and manual. However, Acorn, apparently intend to sell the extras necessary to get the system going for about £30.

We had no trouble with the Cumana drive, and generally disc units tend to be very reliable (touch wood!), but it is as well to make a back-up copy of any program or data that you value.

Not everyone is familiar enough with computing to be able to get a program running on a micro, so an excellent feature of the BBC disc system for non-technical users is its 'auto-boot' facility.

Each disc an be made to load or run software automatically, either on power-up, or as soon as the shift and break keys are pressed on the machine.

Second Processors

The Z80-based 64k Second Processor will improve the poor software situation considerably when it is released, as it will enable the BBC Micro to run the ready-made range of CP/M business software by turning the Model B into an input/output terminal for the processor.

This combination should run CP/M faster than any other micro! Another plus for the Z80 processor will be its ability to re-define the disc controller in the BBC machine to read and write in any CP/M disc formats.

Conclusions

The trend towards business-capable micros is sure to continue. The BBC Micro is certainly well designed as the basis for a business system, with the hardware planned by Acorn allowing the user to expand each set-up to suit individual requirements.

The machine has been slow to generate software, and it is vital that Acorn support both hardware and software development as quickly as possible if they are to satisfy existing owners, and encourage more people to buy the BBC Micro. More could also be done to help independent software writers on programs for the machine.

It looks as if 1983 will be a turning point for the BBC Micro and things could go either way. Lets hope that Acorn can get their act together, because we would be pleased to see this excellent machine in much wider use.

Oric v Vic

It is rumoured that the Vic 20 will soon cost around £100. We compare this highly successful micro with the little known Oric to see if it is a serious competitor.

In February's issue we looked at the ORIC-1, the much-heralded micro from Tangerine, and the people who produced the original low-cost Prestel adaptor – the Tantel.

The Oric we saw then was a pre-production sample which, although it showed how the Oric behaves in general, didn't allow us to see the micro's full capabilities.

Several bits of the internal circuitry were still in prototype mode, which made it difficult for us to check, for instance, the Oric's loading from cassette. We also had only a provisional handbook to work through – now happily we've got the complete item.

Even so, the final (?) Oric handbook doesn't make much mention of well-publicised capability of Oric to attach to the phone lines and deliver computer programs, as held on the Prestel system.

The Oric was specially configured by its software designers to be fully compatible with Prestel – which has resulted in various drawbacks (mentioned later) with its colour-character handling.

For all that, there's really no information in the manual about how to emulate a proper Prestel terminal.

In many ways the Oric falls between two stools – it's certainly a small and eminently portable computer, but it has none of the flashiness of some of the others (Spectrum, Epson HX-20) which could make it instantly appealing to the impulse buyer.

On the other hand it has sophisticated 'enthusiasts' intricate programming features, allowing you to manipulate both BASIC and machine-code instuctions with great ease, but it misses some of the 'open-up-and-interfere' appeal which is evident in other hobbyist micros like the ZX81, Pet, Colour Genie or Lynx.

The over-riding impression given by the Oric – the much-advertised home computer from Tangerine, the people who produced the build-it-yourself Microtan – the impression is that it's trying to be too many things to too many different people. The result is that it's not sure what it is!

It's got moving buttons on the keyboard – but they're not full-size keys like a typewriter, even though they're supposed to be at 'typewriter pitch'.

That means they're set at the same distance from each other as proper typewriter keys for ease of fingering, though with these little white studs your fingers too often slip off!

And with a ridiculous oversight, the manufacturers have left the full-stop off the keyboard. It should be under the > sign, two buttons to the left of the right-hand shift key.

In trying to make the Oric compatible with Prestel, Ceefax and Oracle teletext and the colour changes used by those videotex systems we're left with a very cumbersome method of changing colours on the screen, utterly unlike most other computers – more of that in a moment.

Although the Oric does produce graphics shapes – the standard teletext variety – there's no indication on the keyboard of what you're going to get. So it's really rather a mish-mash; it's more of a dedicated computer-dabbler or enthusiast's machine than a real home games-player's device.

And the 164-page book which comes with it goes into such great detail about such topics as assembler mnemonics and machine code instructions that the makers obviously envisage you writing plenty of programs yourself.

The handbook certainly gives a great insight into program writing, yet for all that, the programs which it cites an examples – and the illustration on the introductory cassette tape – seem really shallow and trivial, as written by a knowledgeable and brainy fourteen-year-old.

The 'Advanced Graphics' chapter, for instance, contains a couple of programs 'Alien Domination' and 'Dropping Aliens' showing how to configure your own redefinable characters. Surely by now this latest computer could offer us something more refreshing than yet more Space Invaders.

Unlike most computers, the Oric has a keyboard sounder. Whenever you press one of the alphabetic or numeric buttons you hear a blip from the built-in speaker.

Pressing the Escape or Return buttons, or any of the four cursor buttons, gives a lower-tone 'blop'. Now this really is useful.

It means – as mentioned in our quick guide to the Oric in February – that you don't have to keep looking at your tv screen or monitor to check that a line's been entered in your program, á la ZX81! You can tell just from the sound that you've pressed the right keys.

And perhaps it's uncharitable to say that it may be more by default than by design that the equals (=) sign is produced without having to press a Shift button.

It certainly makes for much faster FOR/NEXT loop writing than on a Sinclair Spectrum, where the = sign is reached through the 'Symbol Shift' key.

Well it's faster if you discount the Sinclair's single-key word entry! Let's say instead that it's faster than on a Torch, or an Apple or a BBC.

Sounds a small thing, but it's so much handier when program writing, not to have to bother looking to see whether or not to use the Shift button, but to simply plough ahead and press the appropriate key.

The Oric contains a dedicated music chip, which makes it very easy to produce really good sounds. The effects come out of the Oric's base-mounted loudspeaker, not out of your tv speaker.

There are four already-programmed Invader noises, too: 'Zap', 'Ping', 'Explode' and 'Shoot'. Extensive instructions explain how to program-in your own sounds, and there's an audio output socket, to play the sound through a home hi-fi.

Unlike the Sinclair computers or the Vic-20 and many other 'home' computers, the Oric has a 40-column display which, along with its viewdata-style characters, makes it very simple to connect it to the phone to receive Prestel.

Perhaps this forms its claim to being a business machine, along with its output to an RGB (Red, Green, Blue) monitor screen – for a steadier and sharper picture than on an ordinary colour television.

Despite the advertising claim to a *professional* keyboard – presumably a dig at Sinclair's rubber mat – I can see very few business persons being happy with the button-style keyboard, but I can certainly see them using the Oric as a cheap way into Prestel's commodity prices, theatre bookings and news updates, and Micronet 800's telesoftware.

The 16K Oric costs 5p less than the round hundred pounds (that sounds so much more than £99.95, doesn't it?). The 48K RAM version costs £169.95p.

Although previously available just by mail order alone, the Orics are now being sold through High Street stores.

The Commodore VIC-20 (VIC for Video Interface Chip) can now be bought for as little as £120 – fitting between the two Oric models.

But the Commodore sports only 3.5K, of user RAM – in other words you can't write such long programs for the VIC as you can for even the cheaper of the two Orics.

There isn't nearly so much memory space to remember what you've written! Add-on RAM cartridges are available.

Mind you, that's only a very crude rule-of-thumb. It doesn't take into account the large amount of memory which high-resolution graphics can occupy in the Orics, leaving less room for program writing.

The VIC's graphics, although they include plenty of fine lines, are configured in low resolution mode, so not nearly so much memory is 'wasted' on drawings.

The Commodore occupies a keyboard case almost thrice as large – one and a half times as wide, and one and a half times as thick – as the Oric.

If they've both got 'typewriter pitch' keys, why the difference?

Besides the usual QWERTY keys, the VIC has large CTRL (control) and Shift keys, and a RUN/STOP and special Commodore Graphics key to the left of the standard keyboard.

There are also four user-definable function keys on the right side of the keyboard. These, in fact, give eight

Benchmarks – The Oric versus the Vic 20

These eight tests are designed to compare the speed of different machines by running identical programs through them. (See Which Micro – February for more details).

(in seconds)	Oric	Vic 20
Test 1	20.2	12.0
Test 2	17.1	8.1
Test 3	28.2	15.0
Test 4	30.8	16.9
Test 5	37.4	18.2
Test 6	49.8	26.8
Test 7	73.2	42.5
Test 8	227.6	97.8

functions, as they can be used with or without the Shift option.

All of the VIC keys are proper typewriter keys, not – what did we call them in February . . . beads of Beech Nut chewing gum as on the Oric.

With its STOP key, HOME and INSERT buttons, the Commodore seems much easier to use, more friendly than the CP/M-like functions of Ctrl-C, Ctrl-X of the Oric.

The Commodore also shows on its keys the various graphics characters which it will produce. That's always a help, rather than trying to remember which key gives what.

Colour changes on the Commodore relate to exactly those characters which you're currently typing in. Colour changes on the Oric, on the other hand, – using Sinclair-like 'Ink' and 'Paper' commands – affect the whole screen and everything previously written.

Thus if you enter Ctrl-7 on the Commodore for the colour Blue (which is printed clearly on the 7 key) then the next character you type will be in blue.

Typing INK 4, for blue, on the Oric turns *all* characters blue, including all those typed previously. To change the colour of a particular Oric character you need to POKE in the specific colour attributes into the leading bits of the character's matrix table.

Terribly complicated, and liable to take up an extra character space on the screen – just as in the Prestel chunky graphics system!

As the Oric manual lists only its BASIC vocabulary in its look-up back-of-the-book index it's very difficult to find out what are the various colour commands, incidentally, or what are the several 'Ctrl' facilities. The VIC book has a much handier quick reference area.

I do, though – and I seem to be the only one – absolutely hate the VIC's ridiculously wide so-hard-to-read broad spindly letters on screen.

They're horrible!

Imagine each of these printed letters being the same height but twice as wide as they are here on the page, with a broad squished letter E and a crazily wide letter I, and you'll have some idea of the VIC's odd typeface.

With poor spacing between the letters and between lines of text it's very tiring to watch a VIC screen for long.

Against that it must be said that the VIC gives a very crisp display on a normal tv, whereas with two of the Orics we've tried it's been tricky to tune to a completely stable colour picture.

Several tv sets, in fact, have been unable to cope with the high contrast of black text on a white screen, and we've had to use blue on yellow instead, to stop the picture sliding sideways.

But now we've a grumble specific to the VIC's television display – there's a rather fragile little box which has to be connected to the VIC's video cable if you're using a television set, rather than a video monitor.

How fragile? Just one screw holds it together, and just one tread of a dogs paw can pull the cable out of its connections – sorry, Commodore; it's far too flimsy!

COMMENT

So which do we recommend if the money's burning a hole in your chequebook?

We recommend the Oric to one type of person, and the VIC to another – now see if you can identify yourself . . .

ORIC

This computer is for the analytical mind – the one who's not content with simply buying software and watching the picture on the screen.

If you want to learn how to write good programs, the Oric will give you an excellent introduction.

That's partly thanks to the detailed way the manual takes you through BASIC programming, and also due to the powerful IF/THEN/ELSE and REPEAT UNTIL statements in the Oric's ROM.

With the manual's early introduction to PEEK and POKE – and the time-saving DEEK and DOKE which have been implemented in anticipation of plenty of PEEK and POKING – the computer is shown to be a tool which you can configure to any task you set your heart on.

ORIC DIN cassette socket (includes control of cassette motor, as on BBC micro). Operates at 300 or 2400 baud. Scmitt trigger and checksum data checking, but uses any ordinary cassette machine.
Centronics standard parallel printer port can double as 16 general purpose I/O ports.
Expansion port to external RAM, ROM, disc drives, etc. gives full access to CPU. Using external disc storage expands the Oric's internally available RAM to 63K user-access on the 48K model, as some RAM normally occupied by the operating system is now freed by external ROMs.

VIC-20

The VIC is intended to be a fun computer, with the minimum of memory space that you'd need for your own whimsical programs.

Serious applications for the VIC come through add-on plug-in cartridges – Wordcraft-20, for example, or Money-Manager, Simpli-Calc or Adventure.

There is already abundant software for the VIC, and with the enormous number which have been sold there are plenty of club members who can tell you absolutely everything you might ever want to know about the computer. If you don't like feeling a loner you may welcome this support and back-up.

As the Oric has hardly yet put in an appearance there are few club aficionados, and there's no software to mention; you'll have to write nearly everything yourself at present.

VIC DIN audio output socket (allows audio output to separate hi-fi).
Serial Input/Output port (for serial printers, modems &c).
Dedicated cassette connection for Commodore cassette recorder (note: You cannot use an ordinary cassette player with the VIC-20).
Memory expansion port for cartridges and extra RAM.
Parallel port for printer and disc drive connection.

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If Yes state which make and model . . . . . .

If you are chosen as a winner of this competition which prize would you prefer:
BBC Model B
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ORIC COMPETITION RESULTS

As officially stated in our last issue we are now announcing the results of our January Oric 1 competition. If you recall (and it certainly was long ago) we asked you to complete a competition questionnaire. And whilst giving full vent to your critical faculties we asked you to explain your likes and dislikes of *Which Micro?*

The response – in the obligatory words used in such circumstances – was truly over-whelming. However after due consideration and 3000 entries later we have made our decision and have selected the three winners. They are as follows:

Peter R Morgan, St Madoes, Glencarse, Perth.

G D Knapp, Burgess Hill, West Sussex.

Walter Almond, Ben Rhydding, Ilkley, West Yorkshire.

Commiserations are in order to all the thousands of others that did not win but your efforts were not in vain as all the entries were collated and the information concerning what you would and would not like to see in the magazine has been noted and will be taken into account.

Thank you for your response. Why not try this months competition.

ZX81 ADD-ONS

Sinclair's quintessential "starter" micro is now getting long in the tooth. Is it possible to breathe new life into the ZX81?

The Sinclair ZX81 is the most popular computer in Britain, possibly in the world. Yet the average Sinclair owner feels immediately restricted by his machine, and supports an enormous add-on industry in his attempts to broaden its usefulness.

How justified is this dissatisfaction and what kind of new problems can he expect from the more common add-ons?

The most immediate cause for consternation is usually the tiny touch-sensitive keyboard with its system of one-entry keywords and functions. This feature is particularly disconcerting for journalists, who regard a keyboard they can't type on as anathema.

For the ZX81, the Approved Method of Use is simple – rest the index finger of the left hand on the Shift key, to press and release as required, while the equivalent finger of the right hand hovers over the keyboard and strikes at will.

Using this method, a full-size keyboard is as irrelevant for the ZX81 as it would be for a pocket calculator.

On the Spectrum, the single entry keyboard has become a jungly nightmare – 184 characters, sometimes crowded six to a key, with (arguably) five different methods of entering them.

I don't know anybody who remembers it all.

On the ZX81, however, one touch entry is still a manageable idea, near typing speeds can easily be achieved, and the pocket calculator analogy still holds.

I would no more wish to spell out 'INKEY$' as I would to spell out '7x6'.

No, the size of the keyboard is not a problem, and neither is its layout. What does matter is the lack of feedback.

As I've said, it's impossible to touch-type on the 81, and as you crouch over the keyboard there is nothing aural, visual or tactile – to notify you that the machine has registered your dab.

A possible way round this is one of those same-size stick-on keyboards you can get from several peripheral makers. I once spent several happy weeks with the Kempston 'Click' keyboard, until it was stolen from the office.

It did exactly what you'd expect, and always accompanied the noise with a successful entry.

But it costs £26, and if I were buying for myself I'd invest in a rubber-tipped pencil and enter my listings in FAST mode.

The pencil gives your index finger the occassional break, and the FAST mode gives a big, fat flicker on the screen, observable from the corner of the eye, to confirm the completed transaction.

If I were choosing my own birthday present, I'd throw away the pencil and spend someone-else's money on a £10 stick-on keyboard from Filesixty: I haven't used one, but they look fine.

The next preoccupation for our restless 81 owner is usually a RAM pack. Quite right too. The 1K of the standard ZX81 will satisfy no-one except the novice on his first FOR/NEXT loop, or the mad miniaturist painting portraits on a pin-head.

Here comes our first technical term – RAM Pack Wobble (or, as we say in the trade, RPW). This malady is only funny until you suffer it.

Usually as you type in the last line of a 16K program, the screen fills with flak, the keyboard doesn't respond – the ill-fitting RAM pack you bought from Sinclair Research has become momentarily disengaged and crashed the machine. So pull the plug and start again.

When buying a RAM pack, there are only two things to consider; how closely does it fit the machine, and how much does it cost.

Apart from that, a RAM is a RAM is a RAM. The DK Tronics offering is good on both counts; the Sinclair version is equivalently bad.

Of the ZX Printer, many tales can be told; all of them concluding with an unresisting black plastic box being kicked up and down several flights of stairs.

But the printer is undeniably useful, it's compatible with the Spectrum, and at £60 it's the final, most expensive add-on that most 81 owners feel they actually need.

For all these reasons I now append this fool-proof system of obtaining Listings Immaculately Executed (or, as we say, LIES).

First remove the paper carriage from the back of the printer, as if you were about change the roll, and with some kind of solvent, clean the rubber

cylinder which pushes the paper across the electrode.

This will ensure that the feed feeds; though it won't necessarily feed straight.

Next, with a brush, bus ticket or broken beer bottle, attack the burnt carbon you will find Gumming-Up the Nylon Gears (GUNGE), or Clinging to the Inside of the Crack where the Electrode Resides (CLInKERs).

These two simple measures will banish Impacted Bearings and Electrode Tracking (I BET!)

Re-assemble, plug in and enter LLIST. The printer will now be operating as well as it ever can, though a program of more than 1K will mean that the end of the paper curls over the machine, hits the work surface and stops the feed.

So let the listing drape over the edge of the table.

None of this, however, will prevent the paper from feeding crookedly, particularly if the roll is more than half finished.

The only help for this and for the problem of intermittent feed is to boldy grasp the end of the paper and use it to lift the printer an inch or so off the work surface, meanwhile readying that supple wrist to sway, slide, drift and twist on the instant that the paper starts running crooked.

This is DANGLE (Dexterity, Agility and Nerve, Give LLIST Efficiency).

On the other hand you could buy a real printer. You'll need an interface as well – a black box which fits between computer and printer and acts as a translator for their different languages – and the whole package will cost you several times more than the ZX81.

Until recently Dean Electonics offered a thermal printer and interface for around £110, but the only systems now available are extraordinarily expensive ones the type offered by Memotech.

This is office quality at an office budget price. Memotech's handsome black aluminium interface clips neatly and wobblessly on the back of the ZX81, part of a whole family of elegant stackable components from the same company.

Memotech supply the interface with a Seikosha GP100 A printer. Add the £215 price tag for this machine to £40 for the interface and you'll see what I mean about office budgets.

Frankly, if you have this much money to spend then I think you're firmly in BBC territory (Buy a Bigger Computer).

In contrast to Sinclair's un-clean machine, the Seikosha does produce professional-looking hard copy – the brisk rattle of its dot matrix print head scoots across an 80 character width of real computer print-out paper.

The Seikosha manual speaks confidently of various printer commands which enable the user to alter the format of the print-out, but despite months of trying and (literally) dozens of calls to Memotech and Seikosha distributors, I couldn't get any of these options to work except the double height function.

The imposing professionalism of the Memotech system conceals another crucial ommission – its inability to handle graphic or inverse characters. Most 81 programs contain one or both of these tricky items and their replacement by verbalised instruction is a tedious business.

But omit or overlook this chore and a variety of bizarre results will ensue.

Inverse video letters will appear in true video lower case (sometimes useful, that).

Inverse punctuation marks will be utterly transmogrified, such that an inverse video hyphen, for example, will be changed to a true video left hand square bracket!

With graphic characters, however, the results cease to diverting and become potentially catastrophic – the printer will either ignore them, or stop, or crash the program.

So missing one character at the end of a 16K program can dump hours of work.

In defence of Memotech, it should be emphasised that there is no interface capable of translating ZX81 graphics or inverse from a listing into a commercial printer – in other words, into a printer which gives nice-looking results. (This is not true of Spectrum).

The non-standard notation which Clive used for representing the characters in his ZX81 is just too difficult to explain to a standard printer.

And since the demise of the Dean machine, the only non-standard printer suitable for the 81 is Sinclair's own.

I suppose the company have emerged pretty well from this review. Apart from the unstable and slightly overpriced RAM pack, the other oft-criticised features of the ZX81 seem reasonable compromises between economy and effectiveness.

This applies even to the exasperating ZX Printer; unless you already have access to an office machine, or you are obliged to produce immaculate listings for publication (as I was) then the conclusion must be – stick with your Uncle Clive.■

ZX81

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PART 6

COMPUTER BLUFF

Stephen Castell continues his guide to computing with a look at the bluffers way to become an instant expert on programming.

The one final piece in the technical jig-saw is the need for a smattering of knowledge on Computer Programming itself. Before we start, it should be understood that a 'very short course' in Computer Programming is actually almost practically impossible.

To give a proper account of the full richness of the Computer Programming field – and, more to the point, to acquire the skill and experience to become a truly professional computer programmer (and, bluffing apart, there are thank goodness just a few of these dedicated dingbats around) – takes a book (or library) and practical training schedule all on its own.

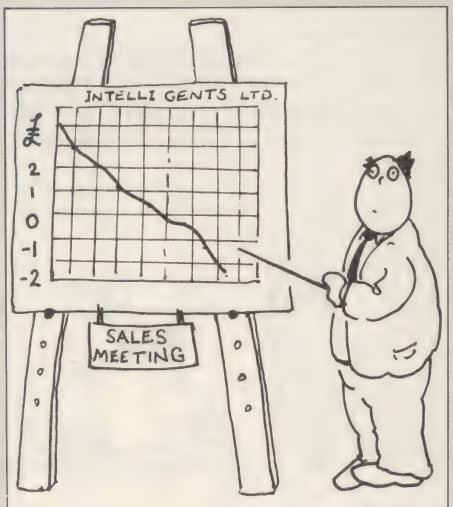
It is, in fact, a nice little bit of Bluff to say something like 'Well, of course, I'm no expert, but I understand that much of the bad computer programming there is today perhaps stems from the misconception that a brief course in computer programming is actually *possible . . . Mere exposure to, say, a couple of high-level languages, without thorough knowledge of the Seven Principles of Systems Analysis, and without sustained training and practice on real applications,* does not constitute adequate instruction in and experience of the field, it seems to *me,* and, I believe, *to a lot of other industry observers . . .*'

So, merrily bluff your way in Computer Programming as follows, but repair to a good library, institution, practical training course, hands-on commercial experience, etc., etc. to seek out the truly professional approach.

It will no doubt have struck the average-to-good Computer Bluffer that the account of the Systems Analytic and Algorithmic Approach to Computing given in the last issue was all to do with *constructing an accurate, interlocking piece-by-piece 'image', within the computer, of the application to be computerised.*

This image is more technically described as a **model,** and the essence of Systems Analysis and Computer Programming may simply be identified as **modelling.**

A particular Computer Programming Language – and let us now think only of **high-level (compiler) languages** (see BASIC, later in this article) – enables this model to be constructed as a sequence of well-defined, readable instructions operating on certain textual symbols (made up at base from the keyboard characters) which represents the elements and constructs of the 'real world' application being computerised.



. . . and at this point we have to pay to get them taken away . . .

Thus, each **statement** of our Computer Program may be dissected and individual elements given a 'meaning' when translated back to the 'real world' application.

This is really no more nor less than the algebra we all learn at school: 'Let x be the number of apples and y be the number of pears . . .' For a 'real world' computer application, we may, rather, wish to express, for example, not apples and pears, but rates of pay, hours worked, r be the rate of pay per hour: then p, gross pay due, is given by h times r'.

In a fragment of BASIC, a widely-used high-level programming language (see later), this might actually be programmed as:

H = 35 hours worked?
R = 4.5 $4.50 or £4.50 rate of pay per hour?
T = H*R '*' means 'times' in BASIC

This trivial example should point up the fact that, as easily, the textual symbols 'H', 'R' and 'T' could be 'H is number of pounds of apples', 'R is price per pound', 'T is total cost' (expensive apples!). the *meaning* we accord to the particular symbols in our BASIC program precisely links the text of the program to our 'real world' application. But, to emphasise, this meaning is not a unique one for the collection of symbols involved: the only meaning the program itself intrinsically has is solely in terms of the binary-based instructions and movements of data carried out by the CPU (as described as earlier Chapters), once the actual program is **compiled** or **interpreted.**

The *meaning* we accord to the text of a high-level program we talk of as its **semantics;** the text itself, and the way it is constructed, we call its **syntax.**

The compiler of a high-level language is an unforgiving piece of software and, for a particular language, the range of symbols we are allowed to employ to construct the text of the program, and the possible ways we might put them together, have to follow a very strict set of rules, if our program is to **compile** (or be **interpreted**) successfully.

The Computer Bluff summary is: get the **syntax** correct and your program will **compile,** giving you **executable code.** Get the **semantics** correct, and your executable code will have a chance of the right 'meaning' – of delivering, eventually, the sought-after results – for your given 'real world' application.

For example, the following is a perfectly *syntactically correct* piece of BASIC:

```
10 H = 35
20 R = 4.5
30 T = H/R
```

'/' means 'divided by' in BASIC; and don't worry about 10, 20, 30 which are line numbers to be explained later.

This would in essence compile or interpret, and, indeed, execute on a

34

computer quite happily, giving 'T' the value 35 divided by 4.5, or 7.777. But, of course, the meaning of T, unless you were a very strange, twisted employer, would no longer be 'gross pay due' . . .

To enable us to construct a high-level computer language 'model' of our real-world application, every high-level programming language has a comprehensive set of well-defined symbols: textual elements which can be given meaning and used to reflect all the aspects and concepts of the application we wish to mirror. BASIC is no exception.

BASIC (Beginners All-purpose Symbolic Instruction Code) was developed specifically as an easy-to-use beginners language, in the spirit of getting novices programming as quickly as possible, typically by means of on-line access to a remote time-sharing computer via a typewriter-like terminal.

Once timesharing mini-computers were established BASIC boomed, and it has boomed tenfold once more with the rise of the 'individual' microcomputer almost none of which commercially on the market from any supplier does not have a version of BASIC available for it for high-level programming.

A computocratic controversy, incidentally, revolves around the fact that there is not just one industry-wide *standard* BASIC, but several dialects – and that goes for most other high-level languages, to some extent, such as **COBOL**, COmmon Business Oriented Language, and **FORTRAN**, FORmula TRANslation.

The syntactical elements of a typical BASIC dialect are as follows:

Variables

These are symbols which can be accorded the meaning 'apples', 'hours worked', 'rates of pay', etc. BASIC allows you to accommodate variables which are known (or expected) to be **real, integer** or **character**, and to store or manipulate whose arrays of connected variables of any particular type.

A **variable name** has to have the syntax 'a letter, or a letter followed by a number'. Thus A, B, C are syntactically valid variable names in BASIC, as are A1, B1, C1. There is a special syntax for the names of integer and character variables:

integer: follow any valid variable name by '%'. e.g. A%, A1%

character: follow any valid name by '$'. e.g. H$, H2$.

Thus 1A, A*, (B) or *X are *not* valid variable names of any type (although some 'dialects' of BASIC now allow 'real names' for variables, which does tend to make programming easier, and programs more legible).

Finally, if we wish to process (store, manipulate, transfer, etc.) a whole sequence of related variables, we can have available the syntax of the **array**: for each individual variable within the array, follow the valid variable name by open round bracket; then by a sequence of literal numbers, or variables, separated by commas; then by close round bracket.

Examples: A1(1) – the first in the array of variables with name A1.
B%(40) – the fortieth varible in the array of integer variables with name B%.

Arrays can be of more than one dimension – examples are: Z$(3,2), A1(1,1) – but we shall not digress into the explanation and use of multi-dimension arrays in BASIC: a bluff is enough . . .

Constants

We can put just about any keyboard character into a BASIC program as a **literal value**. Numeric characters (0-9, plus '.') can be so introduced as **numeric constants** (either real or integer); these, and all the other keyboard characters can be introduced as **character constants**, merely by enclosing them in double quotes.

. . . and this is the D.P. Manager . . . . . my daughter.

Example: 1, 0.9, "ADA", "20" are all constants which may appear as such within a BASIC program.

Operators

These are of three types: arithmetic, string (or character), and logical/relational.

The **arithmetic operators** are simply the usual multiply, divide, add and subtract: *,/,+,-. Example: A*B, C1-E4.

String operators allow manipulation of strings of characters: the simplest are shortening and lengthening. For example, if the string (or character) variable A$ contained the value "COMPUTER" and B$ the value "BLUFF", then after the operation "+", viz as in C$ = A$ +B$, the variable C$ would contain "COMPUTER BLUFF".

Logical and **relational operators** allow **control** to be passed to different parts of a BASIC program depending on the values of appropriate variables at a given point.

Relational operators allow comparisons to be made, such as "greater than", "less than", and "equal to", while logical operators permit more complex conditions to be built up by the conjunction of several **relational conditions.**

These operators are generally used in association with the "IF . . . THEN" statement in BASIC (see **Statements**, below).

Example: 100 IF A<B and B<C THEN 200

This is read as "**If** the value contained in the variable A is **less than** that contained in B **and also** the value in B is **less than** that in C (i.e. B's value lies between that of A and C), **then** continue processing from line number 200 of the BASIC program. Otherwise continue at the next line in sequence after this current IF statement".

Statements

Every statement of BASIC is written on a line of text; each line must begin with a unique **line number**; the program normally processes in ascending line number sequence, beginning at the lowest numbered line, unless control is transferred (for example by an IF statement) in an appropriate manner to another designated line number.

The main types of statement permissible syntactically in BASIC are:

Assignment Statement: this simply places a value, or the result of some calculation or operation, into a given variable, identified by its variable name. Its syntax is: variable name, followed by an "=" character, followed by the value to be assigned (or more generally an **expression** delivering a value).

Examples: 100 A = 1
200 B = A+C* D-E
300 D = D+1 (add one to the current value of the variable D, and replace, or **overwrite,** D with the new value)
400 E% = INT (G*H) (INT is a **function,** often provided as part of the BASIC language itself, which converts the value of an expression like G*H to the nearest smallest whole number. So, if G had value 3.5, H had value 6.12, this assignment statement would assign E% the value INT (3.5*6.12), that is INT (21.42), or 21).

IF . . . THEN Statement and GOTO Statement

We have already encountered this: the IF Statement allows control to be passed to a line number out of sequence with the written text at the point encountered. It has the syntax: IF 'condition' THEN 'line number'.

The 'condition' can be any logical **expression** which, when evaluated, yields either of the values **true** or **false.** The 'line number' must be the number of a line actually written in the full program (you can't jump out of the program or just nowhere!).

```
Example:  90 D = 5
          100 IF A>B THEN
          110 D = 10
          150 D = D+1
```

The value of D as a result of these four statements will be 6 if A is greater than B, 11 otherwise.

The GOTO statement has syntax: GOTO 'line number', and may be regarded as a simple version of the IF statement, being an 'unconditional jump' instruction.

FOR . . . NEXT Statement

This allows repetition, or **looping,** of the same block of a number of statements depending only on the value of a **loop variable.**

The syntax is:

FOR 'assignment of loop variable to initial value'
TO 'exit from loop value of loop variable'
(Statements to be)
(executed within loop)
NEXT 'loop variable name'

All statements between the matched pair of FOR and NEXT statements are executed as many times as is defined by the loop variable running from its initial value to its exit value: on each repetition, the loop variable is automatically incremented (by 1, in this form, or, in a more general form of the FOR statement, by any STEP desired).

```
Example:  100 S = 0
          110 FOR I = 1 TO 20
          120 S = S+ I
          130 NEXT I
```

The statement on line 120 will be executed 20 times, and in fact these four statements will on exit from the FOR loop give S the value of the sum of the first 20 natural numbers (i.e. 210).

REM Statements

REM is short for REMARK and allows comments and explanations to be infiltrated at will throughout the text of a BASIC program.

```
Example:  100 REM NOW CALCU-
LATE TOTAL PAY, T
110 REM H IS HOURS WORKED, R IS
RATE PER HOUR:
120 T = H*R
```

The REM statement is obviously ignored by the BASIC compiler (i.e. it does not result in any executable code); it is, however, arguably one of the most powerful statements in BASIC, since it enables all programs and algorithms to be more or less **self-documenting.**

The principle of (good) self-documentation of programs is very much in keeping with our earlier TVITTR **(algorithm)** and the Seven Principles . . .

INPUT Statement

This allows variables in the program to be given values by entering data through the keyboard.

```
Examples:  100 INPUT N
           110 S = 0
           120 FOR 1 = 1TO N
           130 S = S+I
           140 NEXT I
```

When the BASIC program is run, at line 100 a "?" would appear on the terminal (say, a VDU screen) as a **prompt** to the user that the program is

ready to **accept** data into the variable N through the INPUT statement.

The program goes into an **input wait state** at this point and will not continue processing until something is typed in at the keyboard in response to the "?".

If the value 20 were typed in, then the next four statements, lines 110-140, would result in the variable S having the value 210, as earlier. If 10 were typed in, S would have the value of the sum of the first 10 natural numbers, viz 55.

PRINT Statement

This is, in a sense, the precise opposite of the INPUT statement, enabling values of variables or expressions to be communicated to the terminal from out of the program.

```
Example:  100 PRINT "TOTAL PAY IS";
          H*R
```

If H held the value 35 and R the value 4, this would on execution print at the terminal: TOTAL PAY IS 140. (Notice "TOTAL PAY IS" is a literal character string with 'value' TOTAL PAY IS).

There are various different forms of the PRINT statement, which allow a goodly range of layouts, or **formats,** for values output from the program and printed at the terminal.

In particular a ";" after any value in the PRINT list of variables allows the next value in the list to be printed on the same line.

Otherwise, more than one PRINT statement must be used. Thus, had 100 PRINT "TOTAL PAY IS"; H*R been rather

```
100PRINT "TOTAL PAY IS"
100 PRINT H*R
```

the output to the terminal would have read:

```
TOTAL PAY IS
140
```

DIM Statement

DIM is short for DIMENSION, and allows arrays (see above) to be allocated storage space in main memory. Once allocated, this space is not allowed to be overstepped.

```
Example:  100 DIM A(5)
```

This allocates space for 50 variables A(1) to A(50). Any one of these can be referred to later in the program, such as in the statement 100 A(1) = B*C, or

```
 90 S = 0
100 FOR I = 1 TO 20
110 S = S+A(I)
120 NEXT I
```

These latter four statements will result in S having the value of the sum of the values stored in the first 20 variables A(1) to A(20) of the array A,.

If, at any time in the execution of the program, reference is attempted to a variable A(I), where I is greater than 50, a **run time error** normally results with a message like ARRAY OUT OF BOUNDS being generated by the BASIC interpreter to the terminal. So beware when using arrays to check against your DIMENSIONed **array bounds** at appropriate points in the program.

As we said at the start of this issue, bluffing apart, no-one can teach (good) programming in BASIC in one Chapter of a book like this. And in fact, it is widely held that, even after a lot of expensive training and experience, good programmers may be largely born not made.

But when and if you ever move from Bluffer to Professional, the following two Computer Bluff Principles of Perfect Programming still hold good:

1 **Don't Program It Until It Works:** thoroughly desk-check all algorithms before typing in a single line of program.

2 **If It Works, Program It:** for elegance, substitute *results.*

HOUSING THE MICRO

Using a computer to control the functions of a modern household is not yet an easy task. But if you have the time and money . . .

Stirling Moss has got one. And so have quite a few Americans. No doubts lots of people in Britain would like one too. So if you think a computerised home would be right up your street, take heart. It could be just around the corner.

It's a familiar scene. You arrive home late with the first blizzards of spring settling lightly on your shoulders, public transport chiefs riding high on your hit list come the revolution, and beat a weary path to the front door.

A five-minute fumble for the key ensues. All inside is dark and cold. You now perform the ancient ritual of turning on heating, lighting and soothing music, accompanied by traditional gnashing of teeth and dancing on the spot to keep warm as your "castle" throbs slowly into life.

How much sweeter home would be if all these tedious tasks were taken care of... Whispering your name intimately into the keyhole, you step inside as the door swings magically open.

Welcoming strains of *Coronation Street* float gently to greet you along with the delicious aroma of freshly-brewed coffee.

All you have to do is relax and contemplate the meaning of life – and possibly the electricity bill.

This idyllic image is not such a remote dream. Although at the moment the pieces of the puzzle are ill-fitting to say the least, it seems that where there's a will (and a healthy bank balance) there's a way.

Stirling Moss's six-storey home has a life of its own – just about everything is operated automatically by remote control Yet, incredibly, there is no computer at the helm.

In fact the Mosses don't own one at all. The house has been fitted from top to bottom with a 12-volt system imported from the USA. A lot safer than 240 volts, it runs on bell wire, which makes the system both simple and unobtrusive to install.

Almost 200 electrical functions make appliances all over the house jump into action at the touch of a button. From his study desk Mr Moss can tell the coffee maker in the kitchen to get cracking.

The master bath can be run – to the required temperature, of course – from just about anywhere, and an amazing "ceiling table" set into the kitchen floor will drop through to the "the Nook" on the floor immediately below, when a cosy tv dinner is required.

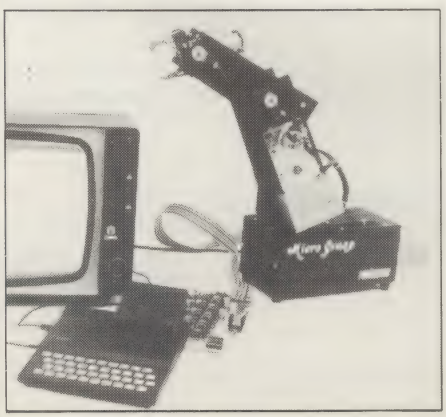
Mrs Moss assures me that most of the mechanics are quite ordinary pieces of equipment cannibalised from unexpected places. The lifting gear which raises and lowers wooden panels concealing a bank of tv and video equipment uses motors from truck windscreen wipers!

The whole set-up has been carefully thought out and planned down to the last detail – there's even a back-up generator which takes over in the event of a power failure.

Could the humble micro take control of such a situation? Everyone knows they're great for zapping alien forces into submission, and can be worth their weight in gold for storing data and solving problems.

But isn't it about time the latest member of the family earned its keep in a more practical way?

The answer is a qualified "yes" – at the moment. For the enterprising electronics hobbyist, possibilities are limited only by the imagination.



Robot arms – watering the plants?

A machine can be connected via relays to all manner of gadgets, switching them on and off at pre-determined times. (The relay has to be there to stop your micro blowing up!)

There is, however, one major drawback – your home is in danger of looking like a spaghetti factory after an explosion with unsightly cables trailing here, there and everywhere.

Until house builders get around to including a "data highway" – a duct to contain these and other necessary wires – as a standard feature in the home, those who wish to pursue this course will have to resign themselves to ripping up the Axminster and sawing lumps off the bottom of internal doors. Architects please take note.

A better solution is to use the existing house mains wiring to conduct signals. Recent products such as the transmitter and receiver kits from TK electronics (£25 and £10 plus VAT respectively) allow you to do just that.

With a friendly electronics expert/electrician/handyman at your disposal and a firm idea of what you want in mind, you should be able to achieve miracles.

But a Micro Grasp robot can be controlled by any micro computer. Once again, its uses in the home would be governed by the imagination.

Plant watering while you're on holiday perhaps. Failing that ... anyone for a bout of arm wrestling?

John Lewis will sell you the basic motor and switch. Made by Graber, it costs around £80 and is compatible with any cording system. Add one computer and you're away.

It's important to remember, though, that while a home computer has got its hands full controlling your environment, it can't really be used for everyday purposes.

Interrupting the program for a quick game of space invaders could lead to complications when you want the machine to resume its control functions.

Until the two-computer household becomes more widespread, the simplest and currently the least expensive alternative is to rely on good old-fashioned integrated circuits – microprocessors which are custom-built for a specific purpose.

Most homes are already crammed with them. They lurk everywhere – in the washing machine, central heating programmer, video, telephone answering machine. The list is endless.

At present nobody seems to have come up with a commercial "package" which takes control of or replaces all these separate pieces of equipment.

The closest development along these lines to date is the Command Centre by Superswitch. It's an elaborate timing device which could represent a milestone on the way to the electronic home.

The computer console at the centre of the system controls up to 16 appliances or portable lamps.

High frequency coded signals are transmitted over the AC mains wiring to receiving modules, which turn whatever is plugged into them on or off as required. Console and modules plug into any mains socket and don't need connecting in any other way.

The starter pack – console, one appliance module and one lamp module – costs £140, with extra modules at £27.60. It may sound like a lot of cash, but once the seven-day program is set the machine could take over your life: waking up with the radio, making your morning coffee and toast, recording radio programmes while you're out, switching on lights and electric blankets at the right time and even turning the washing machine on at dead of night to take advantage of cheap-rate electricity.

And the program can be overridden manually – if you must!

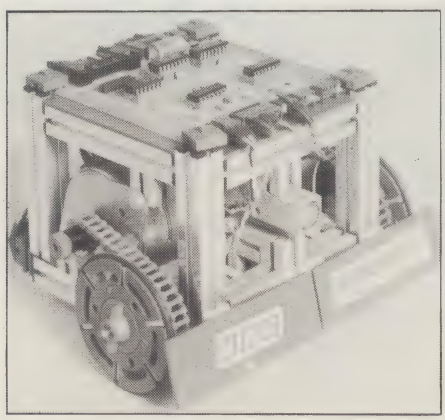
As yet there is no interface to connect the Command Centre to a computer. computer.

The same problem, until recently, afflicted Radio Shack's Plug 'n Power, a similar machine for sale in the USA. Now a number of independent companies have taken matters into their own hands and supplied the missing hardware.

Computerising the Plug 'n Power has proved a great boost to its flexibility.

Radio Shack now boasts a telephone responder package. A remote keypad connected to the telephone handset permits you to ring your home number and issue commands to the responder at the other end of the line.

The Plug 'n Power is not available for the UK market. But before you book the next transatlantic flight, remember that equipment designed for use in the States wouldn't function here because of the voltage difference.



The latest in butlers.

A modem will enable your micro to exchange programs with its computer pals through a telephone link. Such devices are readily obtainable – particularly in kit form.

Maplin Electronics recently featured a design for one in their quarterly magazine. And British Telecom will soon be pushing "telesoftware" down the phone lines via Prestel.

So let's hope it will be possible for the human being to make an appearance in this computer-dominated area, phoning home to tell Mike the friendly micro that the lord and master is on his way home and would like the kettle put on pronto!

The story doesn't quite end there. A robot could be the next add-on for the computer buff's shopping list. Not one of those benign mechanical monsters that shuffle and bleep their way through countless sci-fi pictures, but a different breed, controlled by a micro.

The BBC Buggy is one such creature – it's an entirely free-roving robot on wheels, equipped with sensors enabling it to negotiate a path around obstacles. Designed by Economatics in conjunction with the BBC, it's driven by software tape which incorporates 13 programs.

The Buggy's talents are limitless – it can follow routes, find its way out of a maze, seek out objects, define their shape and return to base, and make beautiful music out of bar codes.

Although developed as an educational aid, it's not too difficult to conjure up some crude applications for the little vehicle in the home.

Apart from scaring Tiddles out of one of his nine lives, it could be used as a waiter, to fetch and carry drinks and food – as long as you're in no hurry.

Robotic arms for use with computers now have a firm hold too. Powertran make a range of articulated hydraulic arms which, I was vehemently informed, are designed primarily for industrial use. ■

TK Electronics, 11 Boston Road, London W7 3SJ. Tel: 01-579 9794

Radiovisor Ltd, Stanhop Works, High Path, London Sw19 2JX. Tel: 01-540 3351

Superswitch Electric Appliances Ltd, 7 Station Trading Estate, Blackwater, Camberley, Surrey GU 17 9AH. Tel: Camberley 34556

Maplin Electronic Supplies Ltd, PO Box 3, Rayleigh, Essex SS6 ¾lr. Tel: Southend-on-Sea 554155.

Economatics Ltd, 4 Orgreave Crescent, Dore House Industrial Estate, Handsworth, Sheffield S13 9NQ. Tel: Sheffield 690801

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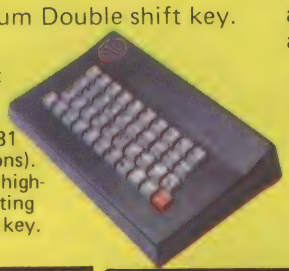

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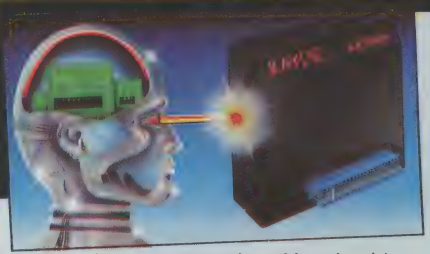

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2 machine code programs — one in ROM, one on tape. Essential for the machine code programmer. An ideal compliment to the assembler built into the BBC machine. Contains a full machine code monitor allowing examination and alteration of memory, registers, setting of break points and even single stepping through machine code programs.

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A ROM containing useful disk utility programs. Enables the recovery of any data off the disk including deleted files etc. The full disk editor allows the alteration of any bytes directly on the disk (or in memory), or the loading and saving of any track or sector on the disk. Automatic transfer of programs from tape to disk and visa versa.
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This includes routines for high resolution screen dumps for both the EPSON and NEC printers. Will work in any graphics mode with automatic grey shading of all screen colours. The most useful feature of this program is its 'spooling' capability, this enables data such as a program listings or high res screen dumps to be automatically spooled from your disk to the printer **while** using your BBC machine for running other programs.
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Wordwise

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all ROM based software requires new series 1 Operating Systems. We are now in the position to supply 1.2 ROM's for £5.00 + VAT when you buy any of the above software.

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Computer Concepts

Dept WMI
16, Wayside, Chipperfield,
Herts, WD4 9JJ. tel (09277) 69727

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BARCLAYCARD VISA

WE'VE MOVED

Which Micro's long-awaited move to larger offices has finally taken place. Readers wishing to send program listings or software reviews for consideration should now address them thus:
Software Editor, Which Micro? and Software Review, Scriptor Court, 155 Farringdon Road, London EC1R 3AD.

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HOME COMPUTER CHESS

We ask what the discerning player should look for, and examine three programs of widely differing quality.

"Reliable? 'Course it is, guv, and it's guaranteed parts and labour for ten million microseconds.

With the current abundance of chess programs for home computers it is no surprise that the manufacturers' advertisements highlight various different features, each of which is supposed to make their particular offering outshine all others.

Which of these are indeed desirable, and which are red herrings?

1. Choice of level of play.
It's a good idea to include this feature in any computer game in which the player challenges the machine. This is especially true of chess, where the degree of difficulty is so intimately linked with the time taken to respond.

A sensible number of levels is no more than four or five – at least the player will then be able to distinguish between them.

The important thing to remember is that even though a game may offer "one thousand levels of play", no-one will ever want to progress up and down the scale in jumps of less than a hundred at a time, nor will the thousand levels make the program a stronger player at the top end or a quicker one at the lower end.

2. Response time.
The length of time it takes the computer to answer your move is a bone of contention for many micro chess players, especially when the computer's best move is "obvious".

Unfortunately, it is here that the

42

HOME COMPUTER CHESS

gulf between most computer chess programs and true artificial intelligence becomes apparent.

Despite its cleverly-programmed emulation of consciousness, the computer itself has no idea that it is playing chess – it is merely processing information and giving back results according to a set of predetermined instructions.

The priorities it obeys may be crudely oversimplified by the flowchart in figure one. Since the full sequence is usually carried out for each move, the "obvious" play is not recognised as such.

Because commercial chess software is predominantly pure machine code, the type of computer used to run the program has a significant and calculable effect. Two similar programs for the Atom and BBC Micro, differing only in details such as the display, would seem very different because of the double speed 6502 processor on the more modern machine.

The BBC version would be able to check moves further ahead in a given time or alternatively to respond with the same degree of caution as the Atom in about half the time.

The only practical way of pitting one program against another is to set the playing levels so that each takes as long as the other to make a move. It would be nice if the documentation of more programs included details of typical "thinking times" at various levels.

3. Display.

Hard-bitten chess enthusiasts may sneer at the priority given to an attractive, easy to understand graphic representation of the chess board.

But for the average player there is nothing more annoying than having to peer at a blurry screen to distinguish a pawn from a bishop.

A common problem is the relative sizes of pieces – it is surprisingly easy to try something daring with a queen only to realize that it is a rook after all.

This can be especially tedious when challenging the machines at its toughest level when it takes perhaps an hour to move and the flesh-and-blood player comes back to the game having forgotten what was where.

4. Handicaps.

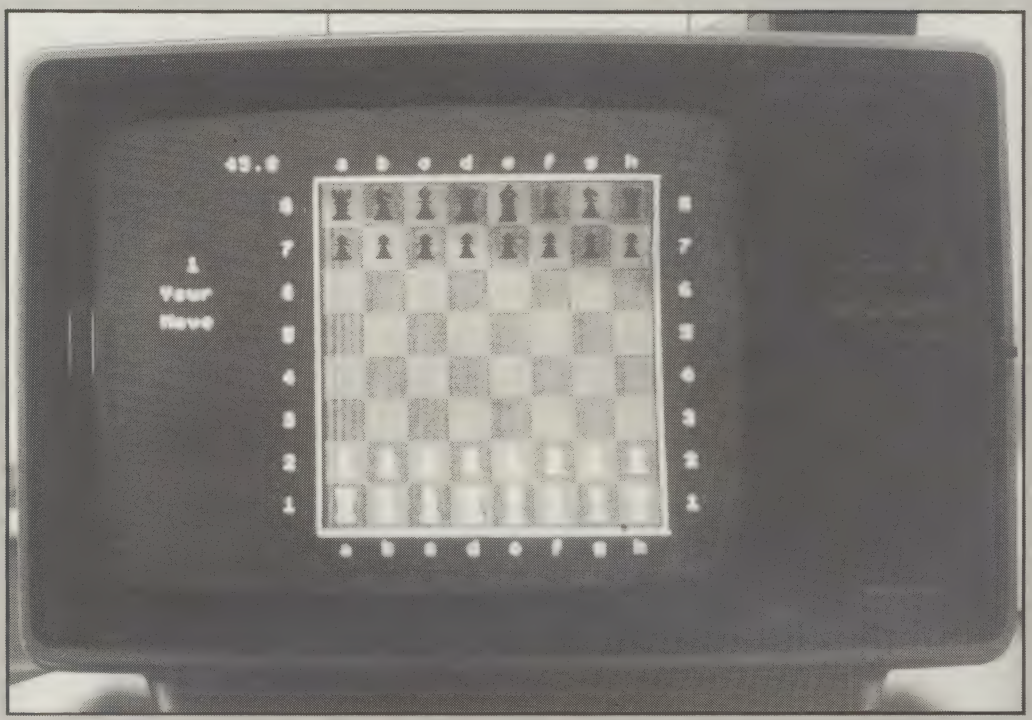
If a skilled player wants a challenging game without waiting hours for the computer to move, the facility of starting off minus a few pieces is very useful.

Unfortunately, this feature seems to appear only rarely in games for the popular home machines.

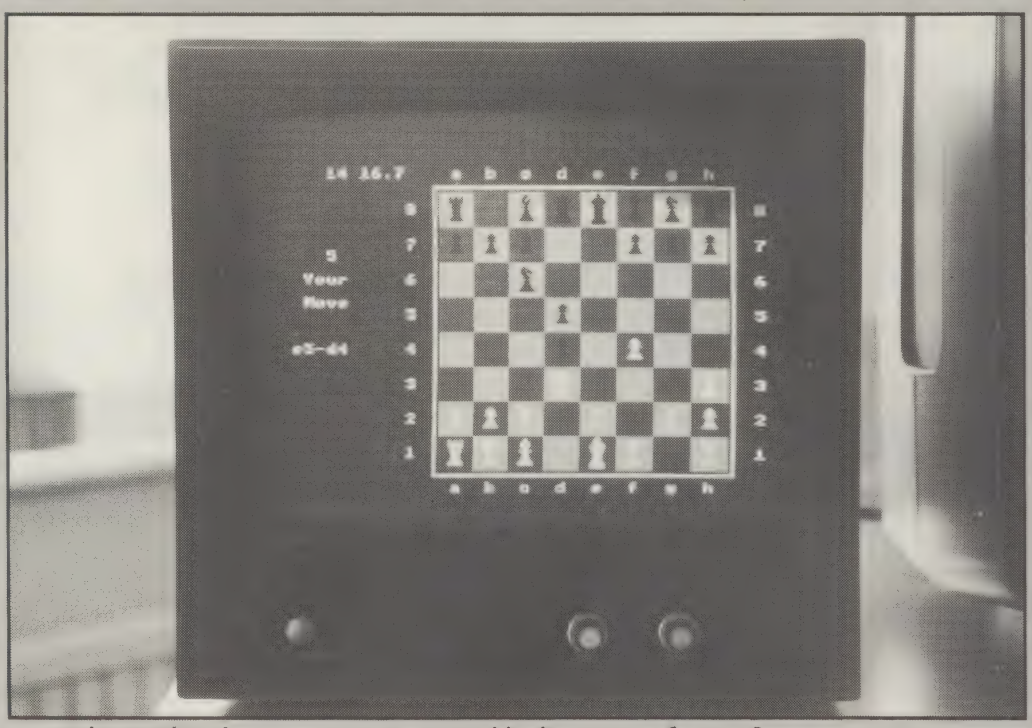
5. Forced moves.

Unlike the computer, we humans, even the chess players among us, have limited reserves of patience, especially when the program is taking a long time to contemplate an obvious move.

Under these circumstances it is very nice to be able to help things along by forcing the wretched thing to make up its mind immediately.



Program Power Chess on the BBC Micro Model B using a TV set . . .



. . . and a monitor. Is your computer wasted by its means of output?

6. Taking back moves.

Many programs on the market do not offer this feature, presumably to discourage cheating, but it is an extremely handy facility under some circumstances.

Those whose interest is in the program itself can try a number of "what if" moves to test the algorithms for different situations, and the feature also allows jaded journalists to salvage the situation after moving the wrong piece by accident!

7. Means of moving.

As indicated above, when it gets to three in the morning the computer has an unfair advantage in knowing the correct designation of each square without fail.

The frail and fallible human, both brain cells resting hard after an all-night game, is liable to become confused when using grid references to steer around the board.

The situation is exacerbated by many programs whem the player decides to play black, and is then obliged to play from the top of the boards downwards rather than in the natural sense.

A solution to the problem is offered by an all too rare system employed by the Dragon Data cartridge, whereby a cursor is simply moved around the screen, with a single key depression picking up a piece, and another serving to put it down in its new position.

As ever, simplicity is the key to success.

8. Book openings.

Giving the computer a library of commonly used opening games can do more than anything to speed up the

Bug Byte-BBC B/Vic 20

This is one of the most disappointing programs we have encountered recently.

It is bad enough when one's first attempt at loading the program fails because of an error in the instructions, but at least this fault puts the player in the right frame of mind for the subsequent problems he can expect.

When the user actually manages to load the program, the next fault soon emerges. The entry of one's chosen level of play results in the message "Stalemate" flashing on the screen. No moves are accepted, and none are offered.

The BBC Micro is a powerful machine, but precognitions is not part of its specification, yet nineteen times out of twenty no play would be allowed and the prediction of a stalemate would appear.

Eventually we did manage to find one level of difficulty at which the program did operate, but Bug-Byte failed to redeem themselves by providing a superior game to compensate for earlier problems.

An attempt to return to the menu, to change the parameters of the game, resulted in the program crashing, thus terminating a generally unedifying experience.

After a while, we packed it in, thinking that Bug-Byte Chess offers more challenge to the programmer than to the chess player.

Program Power-BBC B

We were rather impressed by this offering from the Leeds software house Program Power.

The game loaded satisfactorily, never crashed, and provided a reasonable range of options including Blitz Chess, in which the player has only ten nail-biting seconds to make his move.

The program was notable for the quality of its graphics, which were very close to the appearance of a typical chess set.

The playing strength was mid-way between that of the mediocre Bug-Byte program and the enjoyable Dragon Data offering, but response times often seemed excessively slow at the higher levels.

The closest the program came to demoralising our resident expert was during the Blitz games, when its performance was sufficient to win respect in the eyes of even experienced players.

We only found one real bug in the program – during an opening game, the computer rejected a perfectly valid move as illegal. The fault proved to be transitory, however, and despite trying, we were unable to reproduce it on subsequent occasions.

Considering the price, Program Power Chess is fair value, and is a worthwhile addition to the portfolio of all but really serious chess addicts.

Program Power are on 0532 683186.

Cyrus Chess-Dragon 32

The clear winner in our group of chess programs was Cyrus from Dragon Data, whose cartridge software now seems to be improving rapidly after a somwehat shaky start.

The board is displayed a few seconds after switching on, revealing a clear and easily understood display. The pieces are less lifelike than on the Program Power version, but equally easy to distinguish.

Pressing the space takes the player into the message display mode, which shows a list of the available options as well as the last five moves made.

An especially welcome feature was the method of moving pieces. Rather than use conventional notation you simply move a cursor to the piece to be moved, press ENTER, shift the cursor to where you want the piece to go and just hit ENTER again, Easy!

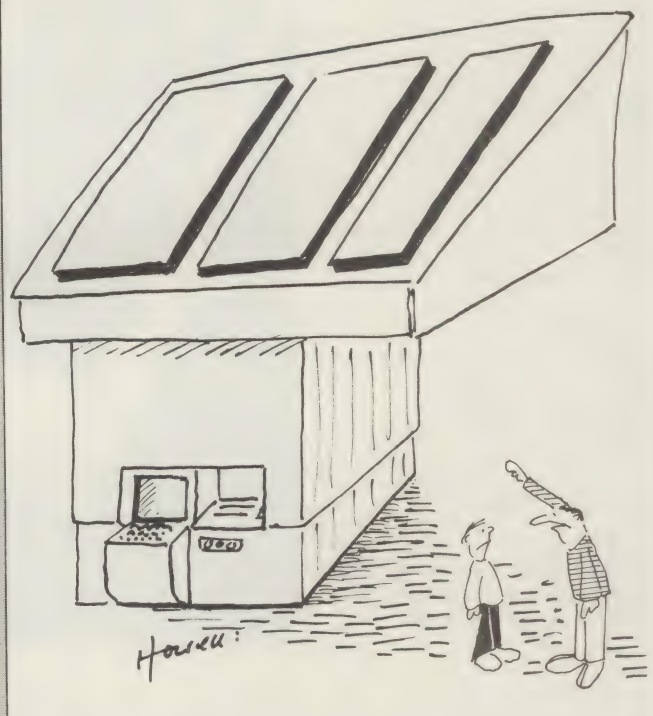
The nine levels of play provide a good spread of ability, and response speeds are notably quick. On the easiest level, Cyrus moves in about one second, with level 4 taking about 30 seconds.

Level 9 is useful for correspondence chess or chess problems, since it does not stop thinking until it is told, or until it spots an inevitable checkmate in the next six moves.

An impressive list of features is available, including changing sides in mid game, inverting the board display so that black plays upwards, asking for hints on the best move and many more.

The actual playing strength is very strong in the middle game, though end games require use of the higher levels to give the competent club player a real struggle.

Our only complaint is the surprising lack of a timing facility, which would have rounded the off package nicely.



Look! I don't care if it is solar-powered – no way is that a micro computer.

early stages of the game. As well as a rapid response, the advantage for the inexperienced player is that he will be encouraged to study and appreciate these enduring standards of the game.

9. Problem solving.

Some chess programs effectively reserve the highest of their settings for the solution of chess programs. If this feature is important to you, be prepared to leave the program running overnight if necessary, since some of these problem-solvers literally never give up until they have cracked the task you set them.

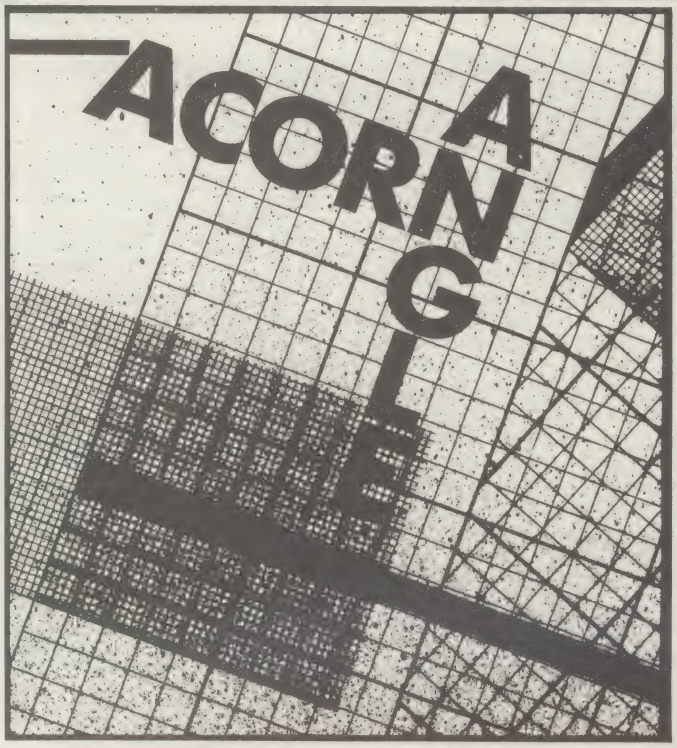
In this field more than any others, it is important to use the program (or at least read a review) before buying.

Some of the products on the market are excellent, but others fail to meet even normal commercial standards. Price is no guarantee of performance.

Dedicated chess players may wish to consider the purchase of a dedicated chess machine. In a future look at the computer chess world, we hope to bring you a report on the latest specialist computer, and how it compares with chess software on standard home computers.

Welcome to the first 'Acorn File', a page of news, information and reviews about both hardware and software for the BBC Micro and its baby brother, the Electron.

Our aim is to keep you up to date with all the most interesting developments for both the machines, although the BBC Micro will probably dominate the scene for a while yet.



THE ELECTRON

Which of the software already written for the BBC machine will be suitable for the Electron, as the new computer supports most of the BBC's graphics modes. What is missing is the teletext Mode 7, and that means re-writing will be necessary to make some programs compatible.

Acornsoft plan to release versions of all their current games software to run on the Electron, which should please intending buyers of the new machines.

The Electron is bound to have a wide appeal with its full-sized keyboard, 32k of RAM and the excellent graphics and established BASIC of the BBC computer, all for well under £200. Doubtless programmers everywhere will soon be falling over themselves to release software for the new machine.

Mind you, they will have to get hold of one first. It is to be hoped that Acorn has learned from its marketing of the BBC computer and will make an effort not to launch the Electron until they have some to sell!

BEEB ROMS

In the meantime, the growing number of people already blessed with a BBC Micro will be pleased to hear that there is plenty of software due for the spring.

Best news comes from Computer Concepts, who are launching more ROM-based programs to follow on from their 'Wordwise' word processor chip. Charles Moir, who runs Computer Concepts, is very enthusiastic about the BBC Micro and its capabilities.

His range of ROMs for the machine will soon include a spreadsheet along the lines of Visicalc, working either in 80 columns or in full colour in the teletext mode, and a printer utility catering for the NEC and Epson ranges.

A suite of utilities called the 'Disk Doctor' will be supplied to aid those running disk drives, and finally a machine code monitor will also be available in ROM.

Watch the BBC Review column for further details!

DISK SOFTWARE

Disks are becoming popular with owners of the BBC Micro, and new software is certainly beginning to reflect that movement. Most of the major companies writing for the BBC machine are now supplying programs as disks with the 40 track single-sided format as 'standard'.

Both Computer Concepts and Acornsoft have a range of games on disk, and Gemini's cassette range of business-biased software can also be ordered in this form.

The Acornsoft range of disks comes beautifully packaged in folding library cases, with the instructions in one side and the disk in the other.

Planetoid — similar to the Defender arcade game — is still my favourite, although the newer Rocket Raid comes a close second with its vivid use of colour and infuriating cavern full of phizzers.

Both games are carefully planned to get tricky at exactly the right point — when you are frustrated enough to have 'just one more go'!

With games as obsessive as these it is important to invest in a joystick to save wear and tear on the keyboard!

Others in the Acornsoft disk range include Meteors, Snapper and Super Invaders, and the programs sell at a reasonable £11.50 each, as opposed to £9.95 for the cassette.

IN THE HIGH-STREET

It seems that computer software has been ear-marked by the big companies as one of the new 'big sellers', for the next few months at least.

W.H. Smith's have plans to expand their range to cover software for machines other than the Spectrum (including the Beeb), and the Virgin Record company has opened a new division to commission and 'sign up' programs for mass consumption.

The BBC Micro and the Electron are bound to feature heavily in these ventures. More news as soon as it is announced!

MICRONET 800

Another place to find BBC sofftware is on British Telecom's Prestel service, through Micronet 800, and there is already a large range of programs in this micro-owners' database ready to be down-loaded with a suitable adaptor.

The BBC computer is among the first batch of micros to be chosen for connection to Micronet and for a £59 outlay to cover the adaptor and £13 per quarter subscription it is now possible to 'grab' items from the software selection.

Some is free, while a scale of charges is made for the rest, which includes offerings from Acornsoft and Beebug.

The initial charge for the adaptor includes postage and packing and VAT, but is an opening offer. Curiously only the first 10,000 will be sold at £59, and after that the price will rise to about £80.

So if you like the idea of downloading Acornsoft's Planetoid over the telephone line for a reduced frame charge of £6.65. I should place your order with the Micronet people now!

PAINTER BBC 32K

One of the entries for our program competition is this game for the BBC Micro Model B, written by Shingo Suigura.

Jobs are hard to find on the planet Duluxe, but even so no-one seems to want the painting job you have applied for.

Could it be the unwelcoming attitude of those bad-tempered guards? Will the mysterious radio-active dustbins claim another victim? Can you spare the time to keep an eye on your ever-dwindling paint supply?

Whatever you do, don't paint yourself into a corner. This game could turn your bristles white overnight!

The BBC Micro is a fine games machine, and a programmer's dream, so why do we see so few games listings for it here at Which Micro? Send in your listing today!

```
>LIST
    1 REM ****************************
    2 REM ********  PAINTER  ********
    3 REM *** BY  SHINGO SUGIURA ***
    4 REM **** (C) FEBRUARY 1983 ***
    5 REM ****************************
    6
   10 ON ERROR GOTO 30
   20 hi%=0:screen%=1
   30 MODE1:PROCinit:PROCinst
   40 live=4
   50 score=0:screen%=1
   60 VDU23;10,32;0;0;0;12
   70 PROCwall:PROCobst
   80 PROCPots:PROCintro
   90 PROCinit
  100 REPEAT
  110 VDU17,1,31,x%,y%,225
  120 PROCwait(speed)
  130 PROCdisplay
  140 IF screen%>5 THEN PROCmusic3 ELSE IF screen%>2 THEN PROCmusic2 ELSE PROCmu
sic1
  150 IF INKEY(-98)=-1 THEN A$="LEFT"
  160 IF INKEY(-67)=-1 THEN A$="RIGHT"
  170 IF INKEY(-73)=-1 THEN A$="UP"
  180 IF INKEY(-105)=-1 THEN A$="DOWN"
  190 VDU17,2,31,x%,y%,227
  200 IF A$="LEFT" THEN x%=x%-1
  210 IF A$="RIGHT" THEN x%=x%+1
  220 IF A$="UP" THEN y%=y%-1
  230 IF A$="DOWN" THEN y%=y%+1
  240 VDU26:col%=POINT(x%*32+16,(31-y%)*32+16)
  250 IF col%<>3 THEN PROCcheck
  260 score=score+.1:Paint=Paint-.1:IF score>51*screen% THEN PROCupdate
  270 IF Paint<3 THEN SOUND2,2,1,1 ELSE SOUND&12,-0,0,0
  280 IF Paint<=0 THEN PROCend
  290 UNTIL FALSE
  300 ****************************************
  310 DEFPROCinit
  320 IF screen%>5 RESTORE 1720 ELSE IF screen%>2 RESTORE 1640 ELSE RESTORE 1120
  330 A$="RIGHT":x%=15:y%=15:Paint=40
  340 ENVELOPE1,1,6,6,6,255,255,255,126,-1,0,-10,126,80
  350 ENVELOPE2,4,6,-3,-3,4,2,2,0,0,-1,0,63,58
  360 VDU23,224,255,255,255,255,255,255,255,255
  370 VDU23,225,24,24,24,24,60,90,255,153
  380 VDU23,226,0,28,62,107,127,99,127,85
  390 VDU23,227,238,219,179,153,245,158,109,170
  400 VDU23,228,24,102,255,90,90,90,90,126
  410 VDU23,229,24,36,66,126,255,126,126,126
  420 VDU23,230,73,42,8,99,8,42,73,0
  430 VDU19,2,5,0;19;4;0;
  440 ENDPROC
  450
  460 DEFPROCwait(T)
  470 FOR delay%=1 TO T:NEXT delay%
  480 ENDPROC
  490
  500 DEFPROCwall
  510 VDU17,1,31,2,30:PRINT"PAINT ";TAB(2,31);"SCORE ";
  520 PRINTTAB(15,30);"LIVES ";live;TAB(30,31);"SCREEN ";screen%;
  530 PRINTTAB(15,31);"HI-SCORE ";TAB(15,0);"<<PAINTER>>";
  540 FOR wall=1 TO 30
  550   VDU17,0,31;wall,1,224,31,wall,28,224
  560   NEXT wall
  570 FOR wall=1 TO 28
  580   VDU31,1,wall,224,31,38,wall,224
  590   NEXTwall
  600 ENDPROC
  610
  620 DEFPROCobst COLOUR0
  630 FOR obst=1 TO screen%*4+6
  640   VDU31,RND(34)+1,RND(26)+1,226
  650   VDU31,RND(34)+1,RND(26)+1,227
  660   SOUND0,-15,6,1 PROCwait(100)
  670   NEXT obst
  680 ENDPROC
  690
  700 DEFPROCPots FOR pots=1 TO level VDU17,1,31,RND(34)+1,RND(25)+1,229
  710   SOUND1,1,RND(100),1 PROCwait(700) NEXT Pots PROCwait(800)
  720 VDU17,1,31,15,15,225,17,0,31,16,15,PRINT" READY!" PROCwait(800)
  730 ENDPROC
  740
  750 DEFPROCcheck
  760 IF col%=1 Paint=Paint+2 SOUND&11,1,1,1 :
  770 IF col%=2 THEN score=score-.1
  780 IF col%=0 THEN PROCend
  790 ENDPROC
  800
  810 DEFPROCdisplay COLOUR1
  820 IF score>hi% THEN hi%=score
  830 PRINTTAB(8,30);INT(Paint);" ";TAB(8,31);INT(score);TAB(24,31);hi%;
  840 ENDPROC
  850
  860 DEFPROCend
  870 SOUND&13,-0,0,0 SOUND0,1,1,5 VDU17,1,31,x%,y%,230 PROCwait(3000)
  880 live=live-1 IF live<=0 THEN 60 ENDPROC
  890 score=0 AFX15,0
  900 PROCdeathtune
  910 VDU17,1,30:PRINT"DEAD!":PRINT"Press SPACE BAR to play again!"
  920 SOUND&12,-0,0,0 SOUND&11,-0,0,0
  930 REPEAT UNTIL GET=32 GOTO 40
  940 ENDPROC
  950
  960 DEFPROCupdate
  970 SOUND&12,-0,0,0 AFX15,0
  980 VDU17,1,31,x%,y%,225,17,0,31,11,14
  990 PRINT"SCREEN ";screen%;" COMPLETED!" PROCnewscreen
 1000 PROCwait(5000) screen%=screen%+1 GOTO60 ENDPROC
 1010
 1020 DEFPROCintro RESTORE1050
 1030 FOR music=1 TO 18 READ Pitch,duration SOUND1,-7,Pitch,duration NEXT music
 1040 PRINTTAB(16,15);"                " PROCwait(3000) ENDPROC
 1050 DATA101,5,121,3,137,5,121,2,129,2,121,2,120,3,121,4,117,5
 1060 DATA101,5,121,3,137,5,121,2,129,2,121,3,129,3,121,4,117,5
 1070
 1080 DEFPROCmusic1 IF ADVAL(-8)<1 THEN ENDPROC
 1090 READ Pitch,duration IF Pitch=0 THEN volume=0 ELSE volume=-7
 1100 IF duration=999 THEN RESTORE 1120 ENDPROC
 1110 SOUND3,volume,Pitch,duration ENDPROC
 1120 DATA101,5,121,5,0,0,121,5,117,3,109,2,117,4,121,5,101,4,0,1
 1130 DATA101,4,0,1,101,4,121,5,0,0,121,5,117,2
 1140 DATA109,2,117,4,121,5,101,4,0,1,101,4,0,1
 1150 DATA101,4,89,5,0,0,89,5,81,5,0,0,81,5,73,6,0,0,101,5,0,0,0
```

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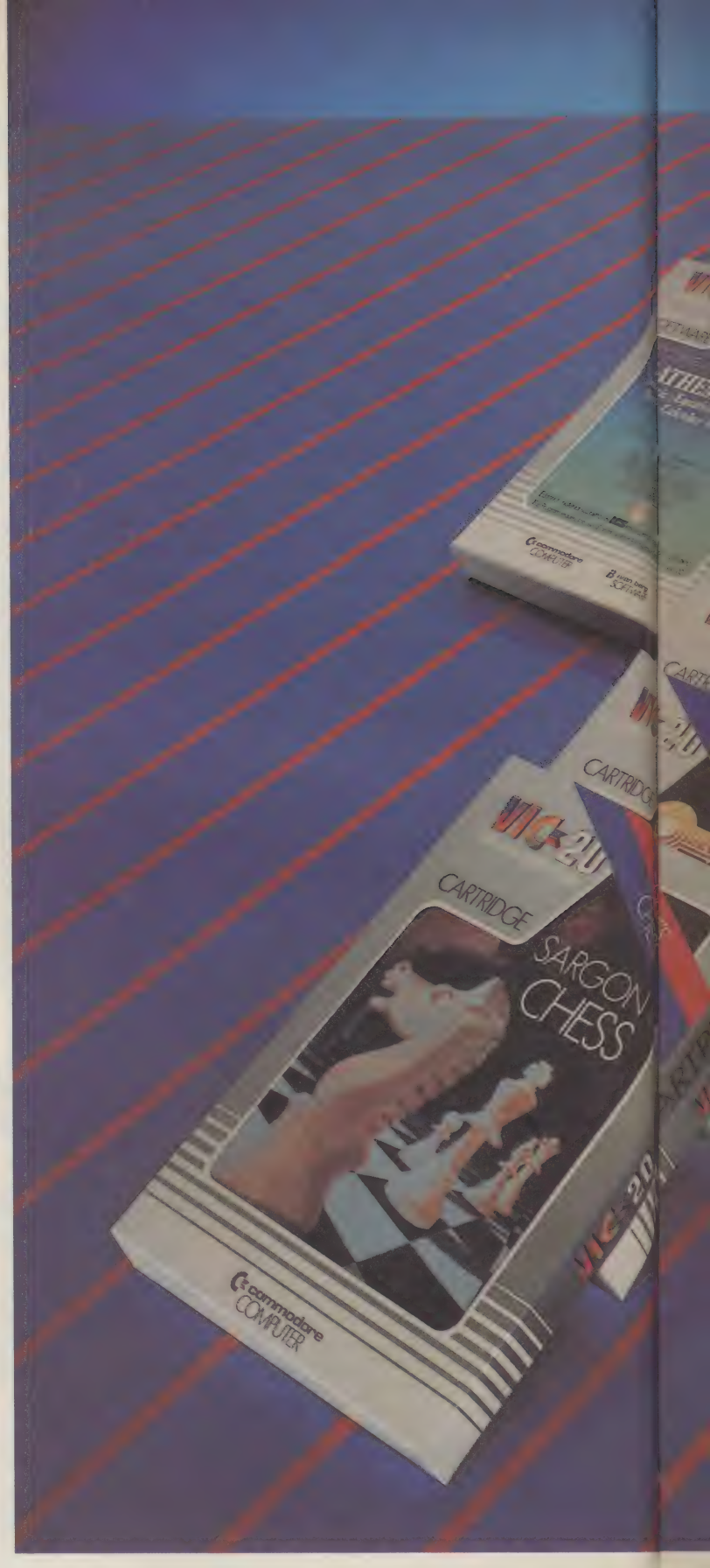

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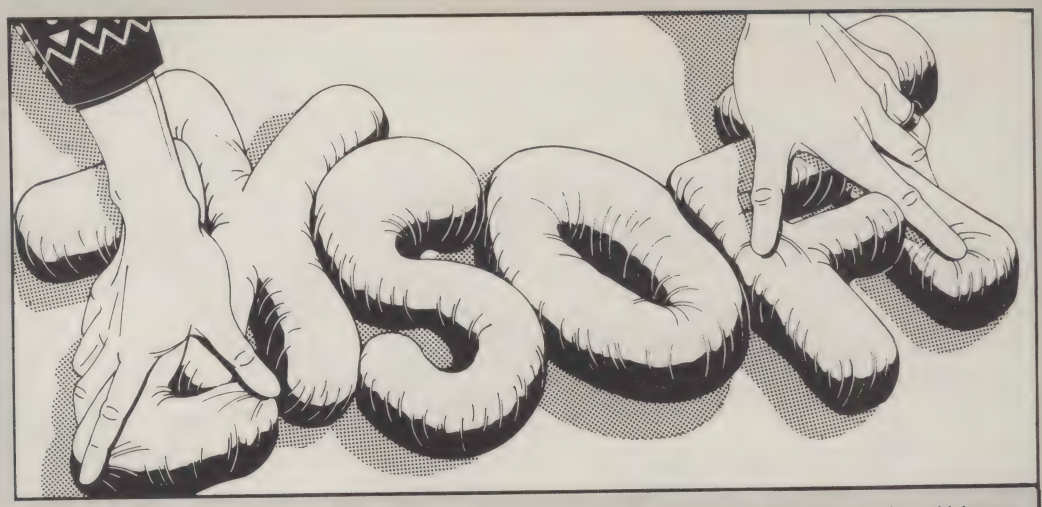
VCWHM0583

Steve Langford's eye falls on the Spectrum and its more serious software. Are your tax problems over? Has Pacman eaten your P45? Read on!



Quite apart from the counter–girls, there is something that draws me rather regularly into my local branch of WH Smith.

As the most accessible retailer of Sinclair computers and associated periphery they seem to get new products as fast as any of the more esoteric outlets. And the past couple of months have seen a welcome increase in software actually being marketed under the Sinclair auspices.

Unlike their earlier ICL material (for both the ZX81 and the Spectrum) some of it is actually rather good.

For a start, a number of previously successful and independent software houses have agreed to let their material (or at least certain aspects of it) be repackaged and sold under the Sinclair banner.

To the initiate (that is at least in this context someone who buys their computer from WH Smiths) the Sinclair name is going to carry more weight than that of a firm previously unknown to them – so commercially it must be a good move.

Assuming that all this operates on a franchise system – a sort of 'By Appointment to HRH Clive Sinclair'? – then surely this must be good news for us too, as it increases our chances of getting superlative software for our superlative computer. (No letters, please!)

One of the companies involved, Psion, is already renowned for its excellent standard–setting programs such as **Flight Simulation**, **Horizons** and the Spectrum demo–tape – quite apart from all the usual file–handling and data–cataloguing stuff. This time, they very quietly released a graphic design program called **VU–3D**.

With this, you are given the opportunity to envisage an object, draw it in 3D, and then view it from any angle at any distance, with hidden–line or shading options (you can even choose the direction of the light source in this shading).

Having drawn the object (which I must admit is a fairly complex procedure), you can also colour it, dump it to the printer, save it to cassette, or if you are as artistic as me, forget about it.

Although there is generally only one sort of object that I ever envisage, a friend of mine who is well known for his hate of computers, but who resides under the title of graphic designer, has been made to eat his words, and uses it with tiresome regularity.

Also recently released by Sinclair are the ranges of adventures A,B,C and D, but now given titles which Artic only used as subtitles before, ie **Planet of Death, Inca Curse, Ship of Doom,** and **Espionage Island.**

Of the four, I only have number three, **Ship of Doom,** and the Artic original at that, complete with ridiculously sparse packaging, in which you have to find the control room on an alien spaceship in order to release your own spaceship from the dastardly Graviton beam that is holding it.

I have tried....and tried....and tried, but success still eludes me. Typing 'HELP' elicits some strange responses at times, occasionally helpful, occasionally not. For instance, what has the comment 'Never trust a woman' got to do with an alien spaceship?

The program also accepted the results of my most frustrating moments, reminding me that there is plenty of time for that sort of thing afterwards. A nice touch!

Next from Sinclair – "in association with Melbourne House" – is the much talked–about, much written–about adventure based on Tolkiens' book **The Hobbit.** This is of such complexity that to do it justice would require a full page, so I'll frustrate the readership by saying no more than that it is the best adventure I have tried, that the frequent graphics are great, and that purchase of the game is virtually a 'must'.

Melbourne House have also produced an excellent 'Scramble' type game called **Penetrator,** in which you have the ability to dictate the landscape that you fly over and the number of enemies that you must contend with. There is a training mode in which you may gather experience in any of the four stages of the game before taking on the real thing. It isn't easy.

Visits to Imagine, Bug–Byte and Quicksilva are imminent, so there should be some news from these next month, and there is still a lot of already–available software that I must get around to reviewing, so hang around!

I had hoped to be able to bring you some much sought–after information on the Microwave, but in the great tradition of these things, my source was thwarted, so we'll all have to wait just a little longer.

Sinclair has sold 200,000 Spectrums outside the USA. At £175 the Spectrum has an excellent technical specification and with 48K RAM, a bundle of memory.

Yet these machines are bought almost exclusively for learning Basic and running games programs. Since the Spectrum was introduced there has been talk of the need for simple applications packages to employ the computer usefully.

Among the first of these is MicroTax UK Income Tax System, designed to help in computing tax liability, completing the form, and ensuring that you pay no more tax than necessary.

The system is a suite of eleven programs and is taped based in the absence of Sinclair's microdrives. Side A deals with income, benefits and expenses, side B with the tax return and computing the tax payable.

There is also no operating manual with the system, all instructions are in the software. As you load the tape these are displayed on the screen, a reminder to zero the tape counter to locate individual programs and that the Enter key enables you to scroll through the pages.

If you accidentally press Break, the Run key will re-run the program. The programs advise you regularly to check screen keyed data before entering it into the computer.

When a program has loaded, STOP TAPE appears on the screen accompanied by an audible hum. A similar instruction tells you when to start loading.

You are not left with a blank screen while loading, but a suggestion that you should look at the Tax handbook. All this adds up to a "user friendly" package as home computer software goes.

The introductory program is concerned with earnings from employment. If you are married and both of you work as employees then this side of the tape must be run twice to take account of each partner's earnings.

Subsequent programmes evaluate the effect on your tax position of a company car, benefits in kind such as company loans and medical insurance, and allowable expenses.

Two further programs deal with the effect of working abroad and redundancy. There is a time lag of several seconds between entering numeric data and it being processed.

Personal data carried forward from each programme is summarised at the end of the tape and can be written down or printed out if you have a printer.

Regrettably it is not possible to save this information to tape so some form of hard copy is necessary. This is not the imposition it might seem – there is a maximum of eight figures to be carried over.

Simple "what if?" calculations, to see the effect of varying a benefit eg taking a company car instead of a salary rise, can be made by re–running the program.

Side B deals with completing an Income Tax return and MicroTax claim that the "package is designed to interface with the tax return." You first of all input the data derived from side A, some additional information, and the programme takes you through the return prompting you to enter information in each box in return.

Prompts are in blue letters. Finally the program arrives at a figure for the tax you will pay.

Is it worth it? This depends entirely on you own tax position. For a single person aged 20 on a low salary probably not.

But for a middle aged, married man enjoying a variety of "perks" and perhaps with some unearned income, it will go a long way to simplifying filling out his tax return.

The system costs £24.95 (inc VAT) and will be available from Spectrum, WH Smiths and Boots.

The package will be available later in the year to run on the NewBrain, BBC B, VIC 20, Commodore 64, Commodore 4000 PET and the Dragon. Schedule D taxation and Capital Gains/Tr-Schedule D taxation and Capital Gains/ Capital Transfer Tax will also be separately catered for. Looking further ahead there are plans for a DIY property conveyance package which could prove very useful.

Introducing Spectrum Machine Code a new book by Ian Sinclair

When Ian Sinclairs book "Introducing Spectrum Machine Code" came into the office I was aware that I could not give the book the time that it justified.

Instead I gave it to a friend, Peter Safranek, who is more conversant with the workings of machine code than I am. Here then are Peters comments.

Realising that I needed a down to earth introduction to programming in machine code I was pleased to find it in Sinclair's book. One of the major problems in understanding machine code programming is identified by the author in chapter six:"...The difficulty, curiously enough, doesn't arise because machine code is difficult, but because it is simple...".

Because machine code programs are constructed from very simple steps, one needs to understand some of the basics of how a computer operates and particularly how it handles numbers.

The first two chapters are devoted to this subject and I had the urge to jump over some of the explanations to get to the machine code programming chapters beyond which is, after all, the object of the exercise!

But I found that I had to return to some of the earlier definitions to understand explanations later in the book.

There are short programs in the text which illustrate various points and this helped to keep my interest going.

After the initial introduction and some digging in the Spectrum's memory, came details of the Z80 microprocessor. Here I come to one of my criticisms of the book.

The details of register set-up, addressing, assembly language structure and commands, register actions and interaction with the Spectrum computer that were given in the text should have been summerised in an appendix.

I made notes as I was reading and these later became the desired appendix to which I refered to time and time again.

My second criticism is that in some cases Ian Sinclair could have expanded on explanations already in the Spectrum manual, rather than starting afresh.

I am thinking particularly of Chapter 24 in the manual, where the memory map and the method of storing program lines, numbers, FOR-Next loops and arrays in computer memory is explained using diagrams.

When the book finally takes us to programming in machine code, Ian Sinclair recommends the use of an assembler for all but the very simplest programs.

Looking through the advertisements in various magazines one can find several assemblers that are now available. I do not have an assembler as yet and I used a very simple dissembler together with the BASIC program given in the book for POKEing machine code into memory.

Here I found that a bug has crept into the book's program. After reserving memory by CLEAR 32500, as suggested, I found that on my 48K machine this created problems.

Whenever I cleared the variable area by using CLEAR or RUN, I found that on subsequent re-inspection of the machine code program, the first byte had changed to 62.

Obviously this corrupted the machine code program. Luckily enough there was a simple solution. By using CLEAR 32499 an additional byte of memory is reserved and machine code starting at 32500 is then not affected by CLEAR or RUN.

Returning to the book, Ian Sinclair explains the use of flow charts when developing programs. Use of flow charts is important on machine code programming mainly because program steps are so simple and numerous that it is easy to lose the overall aim of the program while working on the details of a routine — not seeing the wood for the trees.

The book ends with a few machine code routines which, even though simple, nevertheless show the possibilities which machine code programming open.

Things like a fast line renumber or a program to drive a printer through the casette output for example. But a machine code of this complexity is beyond the capabilities of a beginner.

In the preface to the book the author states that the aim of the book is to give enough information to get started. I have to admit that my appetite has been whetted.

I consider the book to be good value for money at £7.75 for all Spectrum owners looking for a starting point in machine code programming.

CITY ATTACK

Our first Oric listing is City Attack, in which you have to level the buildings to clear a landing space for your stricken craft.

```
LIST
    1 FOR A=0 TO 7:READ D
    2 POKE 46080+A+(8*ASC("C")),D
    3 NEXT A:DATA 62,34,34,62,62,34,34,62
    4 FOR A=0 TO 15:READ D
    5 POKE 46080+A+(8*ASC("("")),D
    6 NEXT A:DATA 0,32,48,63,63,63,0,0,0,0,0,48,62,62,0,0
    7 FOR A=0 TO 7
    8 READ D:POKE 46080+A+(8*ASC(")")),D
    9 NEXT A:DATA 0,0,0,0,4,14,14,4
   10 PRINT CHR$(20):POKE 618,10:S=0:Q$="Score:":LEV=4:GOSUB 2000
   15 FOR A=0 TO 5
   20 POKE 48000+A,ASC(MID$(Q$,A+1,1))
   25 NEXT A:GOSUB 1000
   30 CLS:PLOT 1,26,18:PLOT 38,26,22
   35 FOR A=3 TO 35
   36 IF A>8 AND A<12 OR A>17 AND A<21 OR A>26 AND A<30 THEN NEXT A
   40 FOR B=25 TO 25-((RND(1)*11)+LEV) STEP -1
   45 PLOT A,B,"C"
   50 NEXT B
   55 NEXT A
   60 HEIGHT=4
  100 GOSUB 1000
  105 FOR A=1 TO 35
  110 IF SCRN(A+1,HEIGHT)=ASC("C") THEN GOTO 500
  120 PLOT A-1,HEIGHT,4:PLOT A,HEIGHT,"("
  130 IF KEY$=" " THEN IF BOMB=0 THEN GOTO 400
  140 IF BOMB>0 THEN GOTO 420
  145 WAIT 6
  150 NEXT A
  160 PLOT A-1,HEIGHT,"  "
  170 HEIGHT=HEIGHT+DLEV
  180 IF HEIGHT=26 THEN GOTO 600
  190 GOTO 100
  400 BOMB=HEIGHT
  405 SHOOT:PLAY 7,0,0,0
  410 X=A
  420 PLOT X,BOMB," "
  430 BOMB=BOMB+1
  440 IF BOMB>25 THEN BOMB=0:SOUND 1,0,0:GOTO 100
  450 IF SCRN(X,BOMB)=ASC("C") THEN GOTO 480
  460 PLOT X,BOMB,")":MUSIC 1,1,(8-(BOMB/4)),10
  470 GOTO 150
  480 PLOTX-1,BOMB-1,"\ /":PLOTX-1,BOMB,"- -":PLOTX-1,BOMB+1,"/ \"
  490 FOR W=HEIGHT-1 TO BOMB+1:PLOT X-1,W,"   ":NEXT W
  495 BOMB=0:GOTO 150
  500 EXPLODE:PLOT A-1,HEIGHT,"**":WAIT 40:PLOT A-1,HEIGHT,"  "
  510 GOSUB 1000:WAIT 200
  515 CLS:INK0:FOR A=1 TO 5:PRINT:NEXT
  520 PRINT"ANOTHER GO (Y OR N) ?"
  525 R=0
  530 GET AN$
  533 IF AN$<>"y" AND AN$<>"n" THEN GOTO 530
  536 IF AN$="y" THEN R=1
  540 WAIT 50:CLS:PRINT CHR$(20)
  550 FOR A=48000 TO 48015:POKE A,32:NEXT A
  555 IF R=1 THEN RUN
  560 PRINT CHR$(17):END
  600 PLOT A-1,HEIGHT-1,12:PLOT A,HEIGHT-1,"("
  605 GOSUB 1000
  610 PLOT 12,10,"BONUS : 100"
  615 S=S+100:LEV=LEV+3:IF LEV>11 THEN LEV=11
  620 WAIT 100:GOSUB 1000:WAIT 200
  625 Q$="           ":GOSUB 1000
  630 GOTO 30
 1000 Q$=STR$(S)
 1010 FOR Q=1 TO LEN(Q$)
 1020 POKE 48006+Q,ASC(MID$(Q$,Q,1))
 1030 NEXT Q
 1040 RETURN
 2000 CLS:INK6
 2005 TITLE$="          CITY   ATTACK":PRINT
 2010 PRINT CHR$(131)CHR$(142);TITLE$
 2020 PRINT CHR$(131)CHR$(142);TITLE$
 2030 PRINT:PRINT:PRINT"You have to land your aircraft by "
 2040 PRINT"clearing a runway."
 2050 PRINT"To drop a bomb, Press the 'SPACE' bar."
 2060 PRINT:PRINT"If you land, you recieve a bonus of"
 2070 PRINT"100 Points and a new city."
 2080 PRINT:PRINT"Skill level (1 or 2) ?"
 2090 GET AN$
 2100 IF AN$<>"1" AND AN$<>"2" THEN GOTO 2090
 2110 DLEV=VAL(AN$)
 2120 CLS:PAPER6:INK4
 2130 RETURN
```

MORSE ENCODER

This program for any Spectrum is intended as an aid to learning Morse. It should be used to build up a library of commonly used phrases which can then be used to listen to.
Why not try to record your efforts on tape and send the cassette to a friend? Getting a reply in Morse will give you the incentive you need to build up speed.

```
   5 BORDER 0: PAPER 0: INK 7: C
LS
   6 REM M.F.Gathergood
   7 REM Leith Nautical College
   8 REM Edinburgh EH15 2PP
   9 REM January 14th 1983
  10 PRINT "Morse Encoder"
  20 PRINT
  30 PRINT "Enter speed, 0 TO 9"
  31 INPUT S
  32 IF S=0 THEN LET n=.15: LET
p=20
  33 IF S=1 THEN LET n=.12: LET
p=15
  34 IF S=2 THEN LET n=.10: LET
p=12
  35 IF S=3 THEN LET n=.09: LET
p=10
  36 IF S=4 THEN LET n=.08: LET
p=8
  37 IF S=5 THEN LET n=.07: LET
p=7
  38 IF S=6 THEN LET n=.06: LET
p=6
  39 IF S=7 THEN LET n=.05: LET
p=5
  40 IF S=8 THEN LET n=.04: LET
p=4
  41 IF S=9 THEN LET n=.035: LET
 p=3
  42 PRINT
  43 PRINT "Speed ";S
  44 PRINT
  45 LET m=n*3.5
  50 PRINT "Enter line to be cod
ed"
  60 INPUT A$
  70 PRINT
  80 PRINT A$
  90 LET Z=LEN A$
 100 FOR Q=1 TO Z
 110 LET X$=A$(Q)
 120 REM this is the clever bit
 130 IF X$="1" THEN BEEP n,36: P
AUSE 1: BEEP m,36: PAUSE 1: BEEP
 m,36: PAUSE 1: BEEP m,36: PAUSE
 1: BEEP m,36
 140 IF X$="2" THEN BEEP n,36: P
AUSE 1: BEEP n,36: PAUSE 1: BEEP
 m,36: PAUSE 1: BEEP m,36: PAUSE
 1: BEEP m,36
 150 IF X$="3" THEN BEEP n,36: P
AUSE 1: BEEP n,36: PAUSE 1: BEEP
 n,36: PAUSE 1: BEEP m,36: PAUSE
 1: BEEP m,36
 160 IF X$="4" THEN BEEP n,36: P
AUSE 1: BEEP n,36: PAUSE 1: BEEP
 n,36: PAUSE 1: BEEP n,36: PAUSE
 1: BEEP m,36
 170 IF X$="5" THEN BEEP n,36: P
AUSE 1: BEEP n,36: PAUSE 1: BEEP
 n,36: PAUSE 1: BEEP n,36: PAUSE
 1: BEEP n,36
 180 IF X$="6" THEN BEEP m,36: P
AUSE 1: BEEP n,36: PAUSE 1: BEEP
 n,36: PAUSE 1: BEEP n,36: PAUSE
 1: BEEP n,36
 190 IF X$="7" THEN BEEP m,36: P
AUSE 1: BEEP m,36: PAUSE 1: BEEP
 n,36: PAUSE 1: BEEP n,36: PAUSE
 1: BEEP n,36
 200 IF X$="8" THEN BEEP m,36: P
AUSE 1: BEEP m,36: PAUSE 1: BEEP
 m,36: PAUSE 1: BEEP n,36: PAUSE
 1: BEEP n,36
 210 IF X$="9" THEN BEEP m,36: P
AUSE 1: BEEP m,36: PAUSE 1: BEEP
 m,36: PAUSE 1: BEEP m,36: PAUSE
 1: BEEP n,36
 220 IF X$="0" THEN BEEP m,36: P
AUSE 1: BEEP m,36: PAUSE 1: BEEP
 m,36: PAUSE 1: BEEP m,36: PAUSE
 1: BEEP m,36
 230 IF X$=" " THEN PAUSE p
 240 IF X$="?" THEN BEEP n,36: P
AUSE 1: BEEP n,36: PAUSE 1: BEEP
 m,36: PAUSE 1: BEEP m,36: PAUSE
 1: BEEP n,36: PAUSE 1: BEEP n,3
6
 250 IF X$="." THEN BEEP n,36: P
AUSE 1: BEEP m,36: PAUSE 1: BEEP
 n,36: PAUSE 1: BEEP m,36: PAUSE
 1: BEEP n,36: PAUSE 1: BEEP m,3
6
 260 IF X$="," THEN BEEP m,36: P
AUSE 1: BEEP m,36: PAUSE 1: BEEP
 n,36: PAUSE 1: BEEP n,36: PAUSE
 1: BEEP m,36: PAUSE 1: BEEP m,3
6
 270 IF X$="/" THEN BEEP m,36: P
AUSE 1: BEEP n,36: PAUSE 1: BEEP
 n,36: PAUSE 1: BEEP m,36: PAUSE
 1: BEEP n,36
 280 IF X$="?" THEN BEEP n,36: P
AUSE 1: BEEP m,36: PAUSE 1: BEEP
 n,36: PAUSE 1: BEEP n,36: PAUSE
 1: BEEP m,36: PAUSE 1: BEEP n,3
6
 290 IF X$="(" THEN BEEP m,36: P
AUSE 1: BEEP n,36: PAUSE 1: BEEP
 m,36: PAUSE 1: BEEP m,36: PAUSE
 1: BEEP n,36
 300 IF X$=")" THEN BEEP m,36: P
AUSE 1: BEEP n,36: PAUSE 1: BEEP
 m,36: PAUSE 1: BEEP m,36: PAUSE
 1: BEEP n,36: PAUSE 1: BEEP m,3
6
 310 IF X$="-" THEN BEEP m,36: P
AUSE 1: BEEP n,36: PAUSE 1: BEEP
 n,36: PAUSE 1: BEEP n,36: PAUSE
 1: BEEP n,36: PAUSE 1: BEEP m,3
6
 320 IF X$="+" THEN BEEP n,36: P
AUSE 1: BEEP m,36: PAUSE 1: BEEP
 n,36: PAUSE 1: BEEP m,36: PAUSE
 1: BEEP n,36
 330 IF X$="=" THEN BEEP m,36: P
AUSE 1: BEEP n,36: PAUSE 1: BEEP
 n,36: PAUSE 1: BEEP n,36: PAUSE
 1: BEEP m,36
 340 IF X$="a" THEN BEEP n,36: P
AUSE 1: BEEP m,36
 350 IF X$="b" THEN BEEP m,36: P
AUSE 1: BEEP n,36: PAUSE 1: BEEP
 n,36: PAUSE 1: BEEP n,36
 360 IF X$="c" THEN BEEP m,36: P
AUSE 1: BEEP n,36: PAUSE 1: BEEP
 m,36: PAUSE 1: BEEP n,36
 370 IF X$="d" THEN BEEP m,36: P
AUSE 1: BEEP n,36: PAUSE 1: BEEP
 n,36
 380 IF X$="e" THEN BEEP n,36
 390 IF X$="f" THEN BEEP n,36: P
AUSE 1: BEEP n,36: PAUSE 1: BEEP
 m,36: PAUSE 1: BEEP n,36
 400 IF X$="g" THEN BEEP m,36: P
AUSE 1: BEEP m,36: PAUSE 1: BEEP
 n,36
 410 IF X$="h" THEN BEEP n,36: P
AUSE 1: BEEP n,36: PAUSE 1: BEEP
 n,36: PAUSE 1: BEEP n,36
 420 IF X$="i" THEN BEEP n,36: P
AUSE 1: BEEP n,36
 430 IF X$="j" THEN BEEP n,36: P
```

```
AUSE 1: BEEP m,36: PAUSE 1: BEEP
 m,36: PAUSE 1: BEEP m,36
 440 IF X$="k" THEN BEEP m,36: P
AUSE 1: BEEP n,36: PAUSE 1: BEEP
 m,36
 450 IF X$="l" THEN BEEP n,36: P
AUSE 1: BEEP m,36: PAUSE 1: BEEP
 n,36: PAUSE 1: BEEP n,36
 460 IF X$="m" THEN BEEP m,36: P
AUSE 1: BEEP m,36
 470 IF X$="n" THEN BEEP m,36: P
AUSE 1: BEEP n,36
 480 IF X$="o" THEN BEEP m,36: P
AUSE 1: BEEP m,36: PAUSE 1: BEEP
 m,36
 490 IF X$="p" THEN BEEP n,36: P
AUSE 1: BEEP m,36: PAUSE 1: BEEP
 m,36: PAUSE 1: BEEP n,36
 500 IF X$="q" THEN BEEP m,36: P
AUSE 1: BEEP m,36: PAUSE 1: BEEP
 n,36: PAUSE 1: BEEP m,36
 510 IF X$="r" THEN BEEP n,36: P
AUSE 1: BEEP m,36: PAUSE 1: BEEP
 n,36
 520 IF X$="s" THEN BEEP n,36: P
AUSE 1: BEEP n,36: PAUSE 1: BEEP
 n,36
 530 IF X$="t" THEN BEEP m,36
 540 IF X$="u" THEN BEEP n,36: P
AUSE 1: BEEP n,36: PAUSE 1: BEEP
 m,36
 550 IF X$="v" THEN BEEP n,36: P
AUSE 1: BEEP n,36: PAUSE 1: BEEP
 n,36: PAUSE 1: BEEP m,36
 560 IF X$="w" THEN BEEP n,36: P
AUSE 1: BEEP m,36: PAUSE 1: BEEP
 m,36
 570 IF X$="x" THEN BEEP m,36: P
AUSE 1: BEEP n,36: PAUSE 1: BEEP
 n,36: PAUSE 1: BEEP m,36
 580 IF X$="y" THEN BEEP m,36: P
AUSE 1: BEEP n,36: PAUSE 1: BEEP
 m,36: PAUSE 1: BEEP m,36
 590 IF X$="z" THEN BEEP m,36: P
AUSE 1: BEEP m,36: PAUSE 1: BEEP
 n,36: PAUSE 1: BEEP n,36
1000 PAUSE p/3
2000 NEXT Q
```

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There are simply too many programs and too many computers. Our contributors could compile a list for their own computers, they could not compile one that would include, with any degree of accuracy, any of the others.

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TYPE OR PROGRAM. . . . . .

FOR THE . . . . . COMPUTER. SIZE OF PROGRAM . . . . . K

PUBLISHED BY . . . . . .

HOW MUCH DID YOU PAY FOR IT?. . . . . .

Please mark each section on a scale of 1 to 10.

Quality of program instructions?

Does the program make good use of your computers facilities? (Graphics, Sound etc.)

Does the program hold your attention?

How does the program rate against others of the same type?

Was it easy to learn and use?

Is the program well packaged?

Do you consider it good value for money?

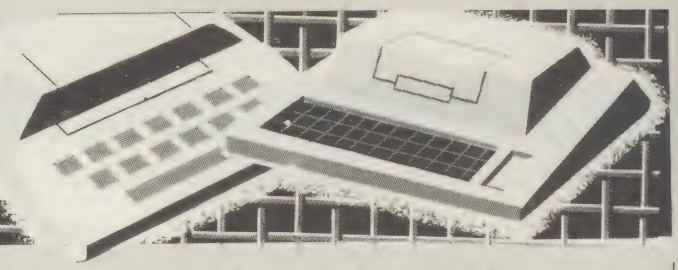
Overall Mark.

Any other comments. . . . . .

. . . . . .

. . . . . .

The A.T.A.R.I. column



This month Ron Stewart returns to programming with graphics

If you remember last month we looked at Graphics mode 9. This month we will continue with Graphics modes 10 and 11.

Mode 11 is the reverse of mode 9. It has one luminance and 16 hues. If you recall last month we said that mode 9 used only one colour register, number 4, which we used to set the base colour.

We use the same register in mode 11 only this time we set the base luminance. This means that our initial SETCOLOR command will be SETCOLOR 4, 0, 8 where 8 is the base luminance and 0 is the value assigned to the hue.

If we set a higher value at this point we may limit the colour possibilities open to us later. We can now load the screen pixels with values of between 0 and 15. (See table 1).

Mode 10 is slightly more complex in it's programming. The main difference between this and the other standard modes is that there are 9 colour registers with which to work.

If you remember we can only access five colour registers using the SETCOLOR command. When we write SETCOLOR in a program the computer will multiply the value we have given to the hue by sixteen and then add to this figure the value allocated to the luminance.

It can then store this number in the appropriate memory address.

When using mode 10 we must calculate this figure for ourselves and then POKE it into the appropriate memory address.

If we require a turquoise colour in register 0 we multiply 10 by 16 and add the luminance value, say 6, to give a figure of 166.

This is the number we poke into the register at address 708. This, therefore, gives us POKE 708,166.

The four registers not locateable through SETCOLOUR can be poked using address's 704 and 707. For the remaining five we can either use the SETCOLOR command or POKE into locations 708 to 712 (see table 2).

TABLE 1

Colour	Setcolor
Grey	0
Light orange (gold)	1
Orange	2
Red-orange	3
Pink	4
Lavender	5
Blue-purple	6
Purple-blue	7
Medium blue	8
Light blue	9
Torquoise	10
Green-blue	11
Green	12
Yellow-green	13
Orange-green	d14
Light orange	15

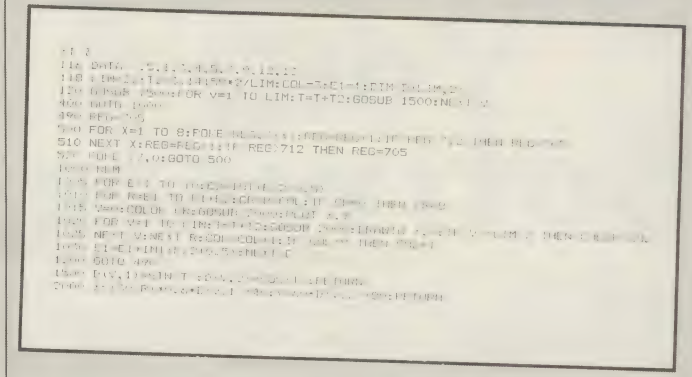
```
1 REM **GRAPHICS MODE 11 DEMO **
10 GRAPHICS 11
20 SETCOLOR 4,0,10
30 X=15:W=65
40 FOR Y=6 TO 13
50 PLOT X,Y:DRAWTO W,Y
60 NEXT Y
70 FOR A=1 TO 15:READ C
80 FOR Y=A*12-1 TO A*12+8.5
90 COLOR C:PLOT X,Y:DRAWTO W,Y
100 NEXT Y:NEXT A
110 DATA 1,2,3,4,5,6,7,8,9,10,
    11,12,13,14,15
120 GOTO 120
```

TABLE 2

Color #	Calls up register in memory address #	Setcolor register #
0	704	—
1	705	—
2	706	—
3	707	—
4	708	0
5	709	1
6	710	2
7	711	3
8	712	4

Formula to find register value
(H x 16) +L. H = Hue + L = Luminance. This must be an even number.

"Why can't you just buy some extra memory, like everybody else?"



Using this mode it is very easy to create high resolution graphics in many colours. If we rotate the colours from register to register we can create the illusion of movement.

As I said last month modes 9, 10 and 11 do not support a text window. We can get around this by initially asking for mode 8 then:
MODE 9 POKE 87, 9: POKE 632,64
MODE 10 POKE 87, 10: POKE 623,128.
MODE 11 POKE 87, 11: POKE 623,192.

As you will see if you try it this will give us a very funny result. But there is a solution using Display List interrupts as the following routine sent in by Mr. R. McConaghie will show.

It uses the "Brass" program of last month so you can just add the extra lines where necessary. It is well documented within the program and needs no further comment from me.

```
80 A=1536:FOR I=0 TO 15:READ X:POKE A+I,X:NEXT I
90 REM DATA FOR INTERRUPT
100 DATA 72,169,0,141,10,212,141,27,208,169,148,141,24,208,104,64
120 GRAPHICS 8
130 DLA=PEEK(560)+PEEK(561)*256:REM THIS FINDS THE START OF THE DISPLAY LIST
140 POKE DLA+166,15+128:REM REQUESTS INTERRUPT
150 POKE 512,0:POKE 513,6:REM TELL OS WHERE TO GO
160 POKE 54286,192:REM GIVE OK FOR INTERRUPT TO PROCEED
180 REM TO USE GR.9 MODE=64
190 REM TO USE GR.10 MODE=128
200 REM TO USE GR.11 MODE=192
210 MODE=64:G=
220 POKE 623,MODE:REM GPRIOR NORMALLY USED FOR P/M GRAPHICS
230 POKE 87,G:REM FOOLS THE O.S. SYSTEM
240 REM SYSTEM IS NOW IN GRAPHICS 9
250 REM BRASS*****AGAIN*****
260 SETCOLOR 4,15,0
270 FOR Y=55 TO 0 STEP -10
280 FOR X=0 TO 24
290 C=X:IF X>11 THEN C=24-X
300
310 Z=Y+5
320 D=INT(SQR(144-(X-12)*
330 COLOR 15
340 PLOT Z,Y+D
350 DRAWTO Z,Y+7+D
360 COLOR C
370 DRAWTO Z,155-Y+D
380 NEXT X:NEXT Y
390 REM FINISHED.NOW FOR THE TITLE
400 REM FIRST WE MUST TELL THE O.S. SYSTEM THAT WE ARE IN GRAPHICS 8
410 POKE 87,8
420 PRINT "                BRASS"
430 GOTO 430
```

CORRECTIONS

Some control characters do not show on the printer. The affected lines are:

330?"(ESC CTRL CLR) (ESC CTRL 2)NOT ALLOWED" etc.

470?"ESC CTRL CLR) (ESC CTRL 2)YOU HAVE BECOME A KING (ESC TAB) etc

600?(ESC CTRL CLR)FIRST" etc

840?"(ESC CTRL CLR) SECOND etc

990?"(ESC CTRL CLR) YOU HAVE etc

1030?"(ESC CTRL CLR) (ESC CTRL 2) NOT ALLOWED etc.

1050T$="(ESC CTRL CLR) IT'S YOUR etc

1310?"(ESC CTRL UP) WHAT IS BLACKS etc 1320 should end "IF N1$=""THEN (ESC CTRL UP);: GOTO 1320.

```
10 REM ************************
20 REM *        DRAUGHTS      *
30 REM *        VERSION 3     *
40 REM *     BY A.J.BRADLEY   *
50 REM * HILLINGDON,MIDDLESEX *
60 REM *       ENGLAND        *
70 REM *  DECEMBER 15th 1982  *
80 REM ************************
90 CLR :DIM A$(20),B$(20),C$(20),D$(12),E$(38),N1$(12),N2$(12),I$(16),T$(16):WH=
:POKE 53277,3:POKE 623,1
100 A=1536:FOR I=0 TO 15:READ X:POKE A+I,X:NEXT I:X=40:Y=17:G=PEEK(106)-20:POKE 54279,G:PMB=256*G:POKE 559,46
:POKE 53277,3:POKE 623,1
110 FOR I=PMB+512 TO PMB+640:POKE I,0:NEXT I:POKE 53248,X:POKE 704,218:FOR I=PMB
+512+Y TO PMB+514+Y
120 POKE I,30:NEXT I
130 ST=STICK(FL-1):IF ST=15 THEN 180
140 IF ST=5 AND X<156 AND Y<81 THEN X=X+10:Y=Y+9:GOTO 110
150 IF ST=9 AND X>86 AND Y<81 THEN X=X-10:Y=Y+9:GOTO 110
160 IF ST=6 AND X<156 AND Y>19 THEN X=X+10:Y=Y-9:GOTO 110
170 IF ST=10 AND X>86 AND Y>19 THEN X=X-10:Y=Y-9:GOTO 110
180 IF STRIG(FL-1)=1 THEN 130
190 LOCATE X-44,Y-15,Z1:LOCATE X-43,Y-17,Z2:LOCATE X-48,Y-19,Z3:GOTO 500
200 IF PL=1 THEN BL=BL-1:IF BL=0 THEN 230
210 IF PL=1 THEN WH=WH-1:IF WH=0 THEN 250
220 RETURN
230 GRAPHICS 18:POKE 708,206:POKE 53248,0:POSITION 6,0:? #6;"DRAUGHTS":? #6:? #6
;"  CONGRATULATIONS!"
240 IF PL=2 THEN 260
250 ? #6;"  "N2$:? #6;"  YOU HAVE BEATEN":? #6;"  "N1$:? #6;"  AND THAT MAKES
YOU  THE CHAMPION":GOTO 270
260 ? #6;"  "N1$:? #6;"  YOU HAVE BEATEN":? #6;"  "N2$:? #6;"  AND THAT MAKES
YOU  THE CHAMPION"
270 POP :? #6:? #6;" TO PLAY AGAIN PRESS       SPACE":POKE 764,255
280 IF PEEK(764)<>33 THEN 280
290 POKE 764,255:RUN
300 IF STRIG(PL-1)=0 THEN 300
310 RETURN
320 ON JU GOTO 330,1030
330 ? "}NOT ALLOWED!":K=1:MO=1:X=X1+46:Y=Y1+17:GOSUB 300:GOTO 110
350 IF PL=2 THEN ? T$:N2$:GOTO 130
360 GOTO 340
370 IF K=1 THEN 420
380 IF PL=1 AND MO=2 THEN POSITION X2,Y
390 IF PL=1 AND MO=3 THEN POSITION X3,Y
400 IF PL=2 AND MO=2 THEN POSITION X2,Y2+2:  #6;D$(7,12):RETURN
410 IF PL=2 AND MO=3 THEN POSITION X3,Y3+2:? #6;D$(7,12):RETURN
420 IF Y<20 AND MO=2 THEN POSITION X2,Y2+2:? #6;D$(1,6):K=2:GOTO 470
430 IF Y<20 AND MO=3 THEN POSITION X3,Y3+2:? #6;D$(1,6):K=2:GOTO 470
440 IF Y>80 AND MO=2 THEN POSITION X2,Y2+2:? #6;D$(7,12):K=2:GOTO 470
450 IF Y>80 AND MO=3 THEN POSITION X3,Y3+2:? #6;D$(7,12):K=2:GOTO 470
460 IF K=1 THEN RETURN
470 ? "}YOU HAVE BECOME A KING AND YOUR TURN IS OVER":K=1:MO=1:JU=1:
:IF PL=3 THEN PL=1
480 FOR W=0 TO 400:NEXT W:GOTO 340
490 IF Y1>Y2 THEN IF Y1-9<>Y2 THEN 320
500 IF Y1<Y2 THEN IF Y1+9<>Y2 THEN 320
510 GOTO 720
520 IF Y1>Y2 THEN IF Y2-9<>Y3 THEN 320
530 IF Y1<Y2 THEN IF Y2+9<>Y3 THEN 320
540 GOTO 930
550 ON MO GOTO 560,610,850
560 X1=X-46:Y1=Y-17:IF Z2=Z3 THEN 320
570 IF Z1<>Z2 THEN K=2
580 IF Z2=0 THEN ON PL GOTO 600,320
590 IF Z2=2 THEN ON PL GOTO 320,600
600 ? "}FIRST ":L$:MO=2:X1=X-46:Y1=Y-17:GOSUB 300:GOTO 130
610 IF Z2=Z3 THEN ON JU GOTO 650,1030
620 IF JU=2 AND (PL=1 AND Z2=0) OR JU=2 AND (PL=2 AND Z2=2) THEN 10
630 IF Z2=2 THEN ON PL GOTO 650,320
640 IF Z2=0 THEN ON PL GOTO 320,650
650 X2=X-46:Y2=Y-17:IF X1<X2 THEN IF X1-10<>X2 THEN GOTO 320
660 IF X1<X2 THEN IF X1+10<>X2 THEN GOTO 320
670 IF K=1 THEN ON PL GOTO 690,710
680 IF K=2 THEN GOTO 490
690 IF Y1-9<>Y2 THEN 320
700 GOTO 730
710 IF Y1+9<>Y2 THEN 320
720 IF PL=1 AND Z2=0 THEN 320
730 IF PL=1 AND Z2=2 THEN 840
740 IF PL=2 AND Z2=0 THEN 840
750 IF PL=2 AND Z2=2 THEN 320
760 FOR I=0 TO 8:POSITION X1-2,Y1-2+I:? #6;A$(11,20):NEXT I
770 ON PL GOTO 780,800
780 POSITION X2+2,Y2:? #6;D$(7,8):POSITION X2+1,Y2+1:
2+2:? #6;D$(7,12)
790 POSITION X2+1,Y2+3:? #6;D$(7,10):POSITION X2+2,Y2+4:? #6;D$(7,8):GOSUB 870:G
OTO 820
800 POSITION X2+2,Y2:? #6;D$(1,2):POSITION X2+1,Y2+1:? #6;D$(1,4):POSITION X2+
+2:? #6;D$(1,6)
810 POSITION X2+1,Y2+3:? #6;D$(1,4):POSITION X2+2,Y2+4:? #6;D$(1,2):GOSUB 870
820 K=1:MO=1:JU=1:X1=X2:Y1=Y2:PL=PL+1:IF PL=3 THEN PL=1
830 GOTO 340
840 ? "}SECOND ":L$:MO=3:GOSUB 300:GOTO 130
850 IF Z2<>Z3 THEN 320
860 X3=X-46:Y3=Y-17:IF X1>X2 THEN IF X2-10<>X3 THEN 320
870 IF X1<X2 THEN IF X2+10<>X3 THEN 320
880 IF K=1 THEN ON PL GOTO 900,920
890 IF K=2 THEN 520
900 IF Y2-9<>Y3 THEN 320
910 GOTO 930
920 IF Y2+9<>Y3 THEN 320
930 FOR I=0 TO 8:POSITION X1-2,Y1-2+I:? #6;A$(11,20):POSITION X2-2,Y2-2+I:? #6;A
$(11,20):NEXT I
940 GOSUB 200:ON PL GOTO 950,970
950 POSITION X3+2,Y3:? #6;D$(7,8):POSITION X3+1,Y3+1:? #6;D$(7,10):POSITION X3,Y
3+2:? #6;D$(7,12)
960 POSITION X3+1,Y3+3:? #6;D$(7,10):POSITION X3+2,Y3+4:? #6;D$(7,8):GOSUB 870:G
OTO 990
970 POSITION X3+2,Y3:? #6;D$(1,2):POSITION X3+1,Y3+1:? #6;D$(1,4):POSITION X3+1,Y3+3:?
+2:? #6;D$(1,6)
980 POSITION X3+1,Y3+3:? #6;D$(1,4):POSITION X3+2,Y3+4:? #6;D$(1,2):GOSUB 870
990 ? "}YOU HAVE MADE A JUMP!":? "TO MAKE ANOTHER PRESS SPACE":? "IF NO!
P":POKE 764,255:X1=X3:Y1=Y3
1000 IF PEEK(764)=33 THEN POKE 764,255:JU=2:GOTO 600
1010 IF PEEK(764)=10 THEN POKE 764,255:X2=X3:Y2=Y3:GOTO 820
1020 GOTO 1000
1030 ? "}NOT ALLOWED! YOU MUSTMAKE A JUMP!":X=X1+46:Y=Y1+17:FOR I=PMB+512 TO PM
B+640:POKE I,0:NEXT I
1040 POKE 704,218:POKE 53248,X:FOR I=PMB+512+Y TO PMB+514+Y:POKE I,30:NEXT I:GOT
O 990
1050 GRAPHICS 7:POKE 559,0:POKE 752,1:JU=1:MO=1:PL=1:K=1:T$="}IT'S YOUR
 T$:N2$:D$="BBBBBBDDDDDD"
1060 A$="AAAAAAAAAACCCCCCCCCC":B$="CCCCCCCCCCAAAAAAAAAA":C$=A$:E$=
1070 POKE 708,20:POKE 709,30:POKE 710,24:POKE 712,66:FOR I=0 TO 3:REP=0
1080 ? #6;E$;:FOR D=0 TO 3:? #6;A$;:NEXT D:? #6:REP=REP+1:IF REP<9 THEN 1080
1090 REP=0:A$=B$
1100 ? #6;E$;:FOR D=0 TO 3:? #6;A$;:NEXT D:? #6:REP=REP+1:IF REP<9 THEN 1100
1110 A$=C$:NEXT I
1120 FOR I=42 TO 102 STEP 20:POSITION I,11:? #6;D$(1,2):POSITION I-1,12:? #6;D$(
1,4):POSITION I-2,13:? #6;D$(1,6)
1130 POSITION I-1,14:? #6;D$(1,4):POSITION I,15:? #6;D$(1,2):POSITION I,65:? #6;
D$(7,8):POSITION I-1,66
1140 ? #6;D$(7,10):POSITION I-2,67:? #6;D$(7,12):POSITION I-1,68:? #6;D$(7,10):P
OSITION I,69:? #6;D$(7,8)
1150 POSITION I,47:? #6;D$(7,8):POSITION I-1,48:? #6;D$(7,10):POSITION I-2,49:?
#6;D$(7,12):POSITION I-1,50
1160 ? #6;D$(7,10):POSITION I,51:? #6;D$(7,8):NEXT I:FOR I=52 TO 112 STEP 20:POS
ITION I,20:? #6;D$(1,2)
1170 POSITION I-1,21:? #6;D$(1,4):POSITION I-2,22:? #6;D$(1,6):POSITION I-1,23:?
 #6;D$(1,4):POSITION I,24
1180 ? #6;D$(1,2):POSITION I,2:? #6;D$(1,2):POSITION I-1,3:? #6;D$(1,4):POSITION
 I-2,4:? #6;D$(1,6)
1190 POSITION I-1,5:? #6;D$(1,4):POSITION I,6:? #6;D$(1,2):POSITION I,56:? #6;D$(
7,8):POSITION I-1,57
1200 ? #6;D$(7,10):POSITION I-2,58:? #6;D$(7,12):POSITION I-1,59:? #6;D$(7,10):P
OSITION I,60:? #6;D$(7,8):NEXT I
1210 L$=" LOCATION IS SET":RETURN
1220 GRAPHICS 0:POKE 752,1:POKE 82,1:POKE 83,38
1230 POSITION 15,0:? "DRAU":? :? " THIS IS AN ORDINARY GAME OF DRAUGHTS PLAYED
O THE USUAL "
1240 ? "RULES WITH ONE    EXEPTION :-":? "  THERE IS NO HUFFING.(REMOVING AN
OPPONENTS PIECE FOR FAILING "
1250 ? "TO MAKE A JUMP WHEN IN A POSITION TO DO SO).":? " PLEASE NOTE : "
1260 ? " 1)BLACK WILL ALWAYS PLAY FIRST.":? " 2)TO MOVE A PIECE POSITION THE CUR
SORON THE PIECE THEN PRESS ";
1270 ? "THE TRIGGER,  THEN MOVE THE CURSOR TO THE PLACE YOU WISH TO MOVE IT TO T
HEN PRESS THTRIGGER AGAIN."
1280 ? " 3)TO MAKE A JUMP YOU MUST FOLLOW THE PREVIOUS INSTRUCTIONS BUT PLACE TH
E  CURSOR ON THE PIECE TO ";
1290 ? "BE JUMPED AND  PRESS THE TRIGGER. THEN GO ONTO THE  PLACE YOU WISH TO J
UMP TO AND PRESS  THE ";
1300 ? "TRIGGER AGAIN.":?
1310 ? "WHAT IS BLACK'S NAME ":: INPUT N2$:IF N2$="" THEN 1310
1320 ? "WHAT IS WHITE'S NAME ":: INPUT N1$:IF N1$="" THEN ? "":GOTO 1320
1330 POKE 82,9:GOTO 1050
```

Critical review?

"The sound commands on the Oric 1 are, for a computer of this price, very sophisticated. Three music channels, and one noise channel, mean that you can program some fairly complex sounds."

POPULAR COMPUTING WEEKLY

"Oric is everything you hoped it would be. Alive with colour, and zapping with built-in sound effects, the Oric looks like a match for any machine now selling for less than £200"

YOUR COMPUTER

"The 16k Oric – fighting the 16k Spectrum – is £25 cheaper. It feels a good deal more 'professional' than the home-appeal Sinclair. Oric's sound is extremely versatile, and well up to the standard of the £300 or £400 BBC microcomputer made by Acorn."

WHICH MICRO?

"Oric was over twice as fast as the Spectrum. Surprisingly perhaps the Oric, which initially seemed only faster when performing the simplest of calculations, has come back to beat the Spectrum by a small amount. As the problems get more complex the Oric comes into its own. One final point – in entering the benchmark tests – the Oric was certainly the easiest to handle."

WHICH MICRO?

"This slope coupled with the design of the keys makes the Oric an easy machine to touch-type on. All keys have auto-repeat and there are four keys dedicated specifically to cursor control. It is certainly easier to type on than any of Sinclair's offerings."

YOUR COMPUTER

"Oric will soon be selling a Modem so that Prestel will become available. Owners will be able to accept telesoftware – programs loaded straight down the phone line – eventually electronic mail could come into the home by the same route, and with the addition of a tape recorder the Oric with its Modem could become a telephone answerer and message taker."

YOUR COMPUTER

"One good feature of the Oric is an on-screen reminder in the top right hand corner to show that you've engaged all-capitals mode. So much better than the BB's variety of lights in the corner of the keyboard. The Oric is sound, simple to get along with and offers great expansion potential."

WHICH MICRO?

"When compared to the stogginess of the Spectrum's keyboard this is certainly an improvement. I can't see any Orics failing through bad assembly. If only the £2400 IBM were so easy to use."

WHICH MICRO?

"Instead of the Spectrum's 28 look-up single-character error reports, the Oric has 18 self-explanatory messages. If you actually want to do computing, rather than just exploring the world of off-the-shelf games programme entertainment the Oric will be a better buy."

WHICH MICRO?

"A good speaker and built-in noises get the Oric's sound off to a good start. Typing Zap, Ping, Shoot or Explode produces convincing arcade game noises which can easily be incorporated into any program."

YOUR COMPUTER

"The modem is certainly unusual in a machine of this price. Together with the other peripherals, when finally available, it should make for an attractive package for a small business... surely a match for machines costing much more"

POPULAR COMPUTING WEEKLY

ORIC-1

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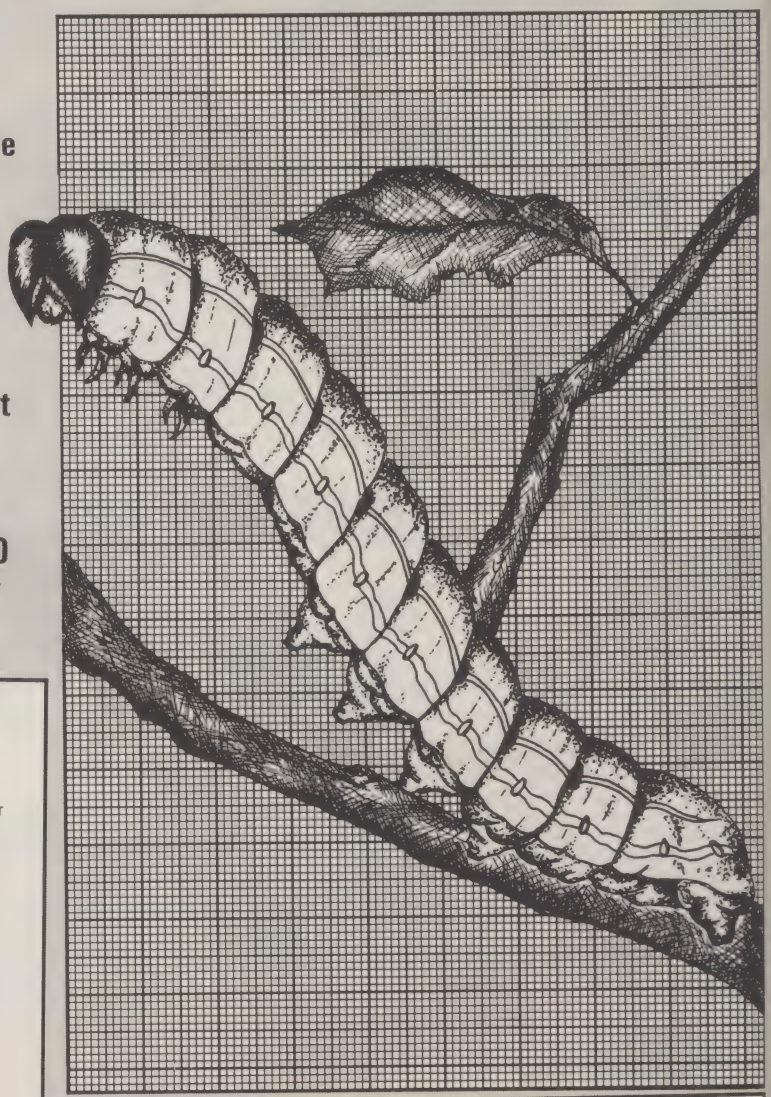
SPACE ATTACK

Space Attack is another Apex Trading game for the Dragon 32.

It's a traditional "shoot 'em up" arcade game in which the object is to wipe out the advancing hordes of bug-eyed monsters before they get you.

Both these games are available on cassette direct from Apex at: 115 Crescent Drive South, Brighton, BN2 6SB. The price is £2.95 for the pair.

It should of course be very easy to convert these games for the Tandy TRS-80 Colour Computer, since they are extremely similar in their Basic interpreters.



```
10 REM
20 REM  SPACE ATTACK
30 REM
40 REM COPYRIGHT 1983
50 REM APEX TRADING LTD
60 REM
70 CLS
80 PRINT@32,"SPACE ATTACK":PRINT
90 PRINT"PRESS YOUR SPACE BAR OR RIGHT  JOYSTICK BUTTON TO FIRE":PRINT
100 PRINT"MOVE THE SIGHTS WITH THE ARROW  KEYS OR JOYSTICK":PRINT
110 PRINT"A SCORE OF 2500 REPLENISHES YOURLASER":PRINT
120 PRINT"THIS GAME IS BEST PLAYED WITH A JOYSTICK":PRINT
130 LINE INPUT "PRESS ENTER TO CONTINUE";NO$
140 CLS
150 PRINT@65,"ENTER SKILL LEVEL"
160 PRINT
170 PRINT"   1 GALACTIC COMMANDER"
180 PRINT"   2 STAR COMMANDER"
190 PRINT"   3 FIGHTER PILOT"
200 PRINT"   4 GUNNER"
210 PRINT"   5 NOVICE"
220 PRINT
230 INPUT " WHICH LEVEL";L
240 IF L<1 OR L>5 THEN 230
250 OL=30:PR=15
260 DIM S(12),N$(12)
270 PRINT
280 INPUT "DO YOU HAVE A JOYSTICK";Q$
290 IF LEFT$(Q$,1)="Y" THEN JS=1
300 MS=25
310 REM  SPEED UP
320 POKE 65495,0
330 CO=1
340 REM  SET UP SCREEN
350 CLS0
360 FOR J=0 TO 63
370 SET(J,0,3)
380 SET(J,31,3)
390 SET(J,29,3)
400 SET(J,30,3)
410 SET(J,28,3)
420 SET(J,27,3)
430 NEXT J
440 FOR J=0 TO 31
450 SET(0,J,3)
460 SET(63,J,3)
470 NEXT J
480 PRINT@450,"SCORE:"SC;
490 PRINT@468,"LASER:"MS;
500 GOTO 1940
510 REM  RANDOM SHIP POSITION
520 R1=INT(RND(33)+12)
530 R2=INT(RND(12)+8)
540 R4=RND(4)-2
550 R3=RND(4)-2
560 IF R3=0 THEN 550
570 RETURN
580 REM  MOVE SHIP
590 R1=R1+R3
600 R2=R2+R4
610 IF R1>50 OR R1<10 OR R2>20 OR R2<5 THEN 520
620 REM  PRINT SHIP
630 SET (R1,R2,CO)
640 SET(R1+2,R2,CO)
650 SET(R1+3,R2,CO)
660 SET(R1-2,R2,CO)
670 SET(R1-3,R2,CO)
680 SET(R1,R2-2,CO)
690 SET(R1,R2+2,CO)
700 RETURN
710 IF JS<>1 THEN 770
720 REM  JOYSTICK ROUTINE
730 SR=INT(JOYSTK(1)/2)
740 SL=JOYSTK(0)
750 IF JS=1 THEN 840
760 REM  KEYBOARD ROUTINE
770 A$=INKEY$
780 IF A$=CHR$(8) THEN SL=SL-4
790 IF A$=CHR$(9) THEN SL=SL+4
800 IF A$=" " THEN 1220
810 IF A$=CHR$(94) THEN SR=SR-4
820 IF A$=CHR$(10) THEN SR=SR+4
830 REM  TEST FOR SCREEN EDGE
840 IF SR>20 THEN SR=20
850 IF SR<7 THEN SR=7
860 IF SL>56 THEN SL=56
870 IF SL<8 THEN SL=8
880 IF SL=OL AND SR=PR THEN 1190
890 REM  MOVE LASER SIGHT
900 FOR J=PR+2 TO PR+4
910 RESET(OL,J)
920 NEXT J
930 FOR J=SR+2 TO SR+4
940 RESET(OL,J)
950 SET(SL,J,2)
960 NEXT J
970 FOR J=PR-4 TO PR-2
980 RESET(OL,J)
990 NEXT J
1000 FOR J=SR-4 TO SR-2
1010 RESET(OL,J)
1020 SET(SL,J,2)
1030 NEXT J
1040 FOR J=OL+3 TO OL+5
1050 RESET(J,PR)
1060 NEXT J
1070 FOR J=SL+3 TO SL+5
1080 RESET(J,PR)
1090 SET(J,SR,2)
1100 NEXT J
1110 FOR J=OL-5 TO OL-3
1120 RESET(J,PR)
1130 NEXT J
1140 FOR J=SL-5 TO SL-3
1150 RESET(J,PR)
1160 SET(J,SR,2)
1170 NEXT J
1180 PR=SR:OL=SL
1190 FOR D=1 TO 100-SK*2:NEXT D
1200 REM  FIRE LASER
1210 IF INKEY$=" " OR PEEK(65280)=126 OR PEEK(65280)=254 THEN 1220 ELSE 1340
1220 FOR J=1 TO 7
1230 SET(SL,SR,4)
1240 SOUND 200,1
1250 RESET(SL,SR)
1260 FOR DE=1 TO 5:NEXT DE
1270 NEXT J
1280 MS=MS-1
1290 PRINT@474,MS;
1300 REM  TEST FOR HIT
1310 IF (SL>R1-L AND SL<R1+L) AND (SR>R2-L AND SR<R2+L)  THEN GOSUB 1750
1320 IF MS=0 THEN EN=1:GOTO 1420
1330 JE=1
```

```
1340 RESET(R1,R2)
1350 RESET(R1+2,R2)
1360 RESET(R1+3,R2)
1370 RESET(R1-3,R2)
1380 RESET(R1-3,R2)
1390 RESET(R1,R2-2)
1400 RESET(R1,R2+2)
1410 IF JF=1 THEN JF=0 GOSUB 520
1420 RETURN
1430 PRINT @480,""
1440 INPUT "YOUR NAME";NM$
1450 IF LEN(NM$)>12 THEN PRINT "TOO LONG!":GOTO 1430
1460 S(10)=SC
1470 N$(10)=NM$
1480 REM  BUBBLE SORT
1490 FOR J=10 TO 2 STEP -1
1500 IF S(J)<S(J-1) THEN 1520
1510 TP=S(J-1)
1520 T$=N$(J-1)
1530 S(J-1)=S(J)
1540 N$(J-1)=N$(J)
1550 S(J)=TP
1560 N$(J)=T$
1570 NEXT J
1580 REM  PRINT HIGH SCORE TABLE
1590 CLS
1600 PRINT@42,"HIGH SCORES":PRINT
1610 FOR M=1 TO 9
1620 PRINT" ";M;" ";S(M);"  ";
1630 PRINT@79+32*M,N$(M)
1640 NEXT M
1650 PRINT@456,"PRESS P TO PLAY"
1660 PRINT@491,"S TO STOP";
1670 A$=INKEY$
1680 IF A$="" THEN 1670
1690 IF A$="S" THEN 2030
1700 SC=0
```

```
1710 EN=0
1720 SK=0
1730 GOTO 490
1740 REM  DIRECT HIT
1750 FOR NS=1 TO 8
1760 SOUND RND(200),1
1770 SET(R1+2,R2-2,CO)
1780 SET(R1-2,R2+2,CO)
1790 SET(R1-2,R2-2,CO)
1800 SET(R1+2,R2+2,CO)
1810 RESET(R1+2,R2-2)
1820 RESET(R1-3,R2+3)
1830 RESET(R1-2,R2-2)
1840 RESET(R1+2,R2+2)
1850 NEXT NS
1860 SC=SC+30*EN
1870 PRINT@456,SC;
1880 IF SC=2520 THEN SK=SK+5:PRINT@474,SK;
1890 REM  CHANGE COLOUR
1900 CO=CO+1
1910 IF CO=9 THEN CO=8
1920 CO=(CO+2)*10
1930 RETURN
1940 GOSUB 520
1950 REM  MAIN LOOP
1960 GOSUB 710
1970 IF EN=1 THEN 1430
1980 GOSUB 590
1990 GOSUB 710
2000 IF EN=1 THEN 1430
2010 GOTO 1960
2020 REM  NORMAL SPEED
2030 POKE 65494,0
2040 END
```

CATERPILLAR

The first program in what we hope will be a continuing series of professionally written games for various popular machines is Caterpillar, from Apex Trading's range of Dragon 32 software.

The game itself is self-explanatory — indeed the program is notable for its clear structure and readability.

The nerve-wracking task of steering an ever growing monster around an obstacle course of fiendish complexity is faithfully implemented, and a wide range of skill levels is catered for.

Keep your wits about you, and mind you don't run into yourself!

```
10 REM
20 REM  CATERPILLAR
30 REM
40 REM  COPYRIGHT 1983
50 REM  APEX TRADING LTD
60 REM
70 CLS
80 PRINT"CATERPILLAR":PRINT
90 PRINT"YOU ARE A FAST GROWING          CATERPILLAR.":PRINT
100 PRINT "GUIDE YOUR BODY AROUND THE ";
110 PRINT "SCREEN USING THE ARROW KEYS.":PRINT
120 PRINT"THE GAME ENDS IF YOU BUMP INTO ";
130 PRINT "THE WALLS, THE RANDOMLY PLACED"
140 PRINT "OBSTACLES OR YOUR OWN BODY.":PRINT
150 LINE INPUT "PRESS ENTER TO START";NO$
160 SOUND 200,1
170 DIM M(64,32),S(12),N$(12)
180 CLS
190 PRINT@64
200 PRINT@74,"skill level"
210 PRINT:PRINT:PRINT
220 INPUT "     (0=EASY, 100=HARD) ";SK
230 SOUND 200,1
240 IF SK<0 OR SK>100 THEN PRINT"BETWEEN 0 AND 100 PLEASE!":GOTO 220
250 REM  SPEED UP
260 POKE 65495,0
270 X=2:Y=2
280 DR=4
290 REM  SET UP SCREEN
300 CLS0
310 FOR J=1 TO 30+SK
320 R1=INT(RND(63))
330 R2=INT(RND(31))
340 SET(R1,R2,4)
```

```
350 M(R1,R2)=2
360 NEXT J
370 M(2,2)=0:M(2,3)=0
380 FOR J=0 TO 63
390 SET(J,0,4)
400 SET(J,31,4)
410 NEXT J
420 FOR J=0 TO 31
430 SET(0,J,4)
440 SET(63,J,4)
450 NEXT J
460 REM  MAIN LOOP
470 SET(X,Y,1)
480 IF M(X,Y)<>0 THEN 720
490 M(X,Y)=1
500 SC=SC+10
510 FOR D=1 TO 100-SK:NEXT D
520 REM  LOOK AT KEYBOARD
530 A$=INKEY$
540 IF A$=""THEN 590
550 IF A$=CHR$(8) THEN DR=1
560 IF A$=CHR$(9) THEN DR=2
570 IF A$=CHR$(94) THEN DR=3
580 IF A$=CHR$(10) THEN DR=4
590 ON DR GOTO 600,630,650,680
600 X=X-1
610 IF X<1 THEN X=1
620 GOTO 470
630 X=X+1:IF X>63 THEN X=63
640 GOTO 470
650 Y=Y-1
660 IF Y<1 THEN Y=1
670 GOTO 470
680 Y=Y+1
690 IF Y>31 THEN Y=31
700 GOTO 470
710 REM  COLLISION
720 FOR SN=1 TO 25
730 SET(X,Y,1)
740 SOUND 95,1
750 RESET(X,Y)
760 FOR DE=1 TO 20:NEXT DE
770 NEXT SN
780 FOR DE=1 TO 800:NEXT DE
790 PRINT@480,"YOUR SCORE IS";SC
800 PRINT
810 INPUT"YOUR NAME";NM$
820 IF LEN(NM$)>12 THEN PRINT "TOO LONG!":GOTO 810
830 S(10)=SC
840 N$(10)=NM$
850 REM  BUBBLE SORT
860 FOR J=10 TO 2 STEP-1
870 IF S(J)<S(J-1) THEN 940
880 TP=S(J-1)
890 T$=N$(J-1)
900 S(J-1)=S(J)
910 N$(J-1)=N$(J)
920 S(J)=TP
930 N$(J)=T$
940 NEXT J
950 REM  PRINT HIGH SCORE TABLE
960 CLS
970 PRINT@42,"HIGH SCORES":PRINT
980 FOR M=1 TO 9
990 PRINT " ";M;" ";S(M);"  ";
1000 PRINT@79+32*M,N$(M)
1010 NEXT M
1020 PRINT@456,"PRESS P TO PLAY";
1030 PRINT@491,"S TO STOP";
1040 A$=INKEY$
1050 IF A$="" THEN 1040
1060 SOUND 100,2
1070 IF A$="S" THEN 1150
1080 REM  INITIALISE
1090 FOR J=1 TO 64
1100 FOR K=1 TO 32
1110 M(J,K)=0
1120 NEXT K,J
1130 SC=0
1140 GOTO 270
1150 POKE 65494,0
1160 END
```

In launching the Commodore 64, Commodore Business Machines followed a path they had earlier walked along with the PET and the VIC 20.

A good, useful and versatile computer. But currently supplied with no documentation, no hardware support and no software support.

As before, they seem content to let everyone else come out with the kind of backup material that they should have produced in the first place, so this month we'll take a look at some of the early products that are beginning to appear on the market.

Since much of this will be reworking of earlier VIC products, owners of the original machine should read on! You never know what you might find.

Almost inevitably much of the new software concentrates on game playing, with a number of 'arcade-type' packages predominating.

Audiogenic, the Reading-based company responsible for a lot of VIC software, are busy producing new names for the 64, and one of their first efforts is called **Motor Mania.**

Described as "a thrilling cross-country car race game," it is quite good, and shows some of the nicer features of sprite graphics. Available on cassette, it will cost you £8.95.

Their only other 64 game at the moment is **Renaissance,** a version of the board game Othello, and a difficult opponent it is too. On its highest level, — you've got 9 to choose from — it is virtually impossible to beat.

Holding forth

Future attractions include Forth, at an unannounced price. Two versions will be available, a standard implementation of **Fig-Forth** fitting in 8K, and a 16K version of **Forth-79,** with floating point, sprite handling, and so on.

Dave Middleton, the author of the above, and two other future 64 programs (**Monitor,** complete with a disassembler, and a database called **Magpie,** of which more next month, with luck) would not be drawn on pricing for any of these, but did promise a delivery date of around the end of April.

Apparently the big hold-up at present is production of the manuals, so perhaps he ought to use **Wordcraft 64,** another Audiogenic package.

This is, as you might have gathered, a version of Wordcraft for the Commodore 64. According to some, the best word processing package available on any Commodore machine, but then aren't they all?

Perhaps their best program is one called **Grandmaster,** and yes, it is a chess game. A very powerful one too, although only available for the standard VIC at present. Ten levels of play, a whole host of features, and dealers who are looking for a demonstration program for their showroom window could do worse than consider this, as it has a self-play mode. Well worth the advertised price of £17.95. For further details, as they say, ring Jeremy Biggs on 01-290 6044.

Three other major games distributors are leaping onto the bandwagon as well. Supersoft (01-861 1166), Rabbit Software (01-863 0833) and Llamasoft (never did understand that name, on 07356 4478) are all rapidly writing vast numbers of games for the 64.

Mutant Camels

The pick of the crop has to be Llamasofts **Attack of the Mutant Camels,** if only for the name! Ninety foot high, neutronium shielded, laser-splitting death camels are stalking the earth, and you, with only a tiny fighter at your control, have to shoot them down and save the human stronghold. A gem, at £8.50.

There is, you'll be relieved to know, some more serious software about as well. Micro-Simplex (0625 615000) have produced **Simplex 64,** a powerful accounting system, which incorporates stock control, preparing of

CITY RUN FOR PET

Can you bomb the city and land? M. Hutchinson and S. Leck extend the challenge in this game written for any Pet with the new ROM.

Unlike some programs of this kind, City Run gives a random landscape every time it is played.

To convert to the old ROM Pet, just change PEEK (151) to PEEK (515) where apt.

```
1 PRINT"□     INSTRUCTION (Y/N) ?"
2 GETA$ IFA$=""THEN2
3 IFA$="Y"THENGOSUB1000
5 GOSUB500
6 E=32768
7 TI$="000000"
10 PRINT"□"
20 FORX=0TO39STEP2
30 LETY=INT(RND(1)*(D*10))*15
40 FORA=0TOYSTEP40
50 POKE33688-A+X,219
55 POKE33688-A+X+1,102
56 NEXTA
57 POKE33688-A+X,233
60 POKE33688-A+X+1,223
70 NEXTN
80 F=1
100 E=E+1
105 IF PEEK(E+3)<>115 AND PEEK(E+3)<>32 THEN 600
106 IF E=33755 THEN 3000
110 POKEE,252:POKEE+1,232:POKEE+2,115
120 POKEE-1,32
125 IF PEEK(151)=6 THEN F=2
130 ON F GOTO100,200
200 W=W+39
205 IF PEEK(E+W)<>46 AND PEEK(E+W)<>32 THEN V=V+1
210 POKEE+W,127:POKEE+W+1,255
215 POKE(E+W)-40,32:POKE(E+W)-39,32
220 IF V=5 OR (E+W)>=33728THEN POKE E+W,32:POKEE+W+1,32 F=1 V=0 W=0
230 GOTO100
500 PRINT"□"
510 INPUT "WHAT IS YOUR LEVEL (1-5)";D
520 IF D<1 OR D>5 THEN RUN 5
530 PRINT"■■■■HIT ANY KEY TO CONTINUE"
540 IF PEEK(151)=255 THEN 540
550 RETURN
600 PRINT"■YOU'VE CRASHED !!!"
601 X=ABS(INT(E-32768)/40):P=E+40
605 FORM=XTO24
606 C=PEEK(P)
607 POKEP,59
610 FORN=-1TO1:POKEE+N,255:NEXT
620 FORN=1TO50:NEXT
630 FORN=-1TO1:POKEE+N,127:NEXT
635 FORN=1TO50:NEXT
636 POKEP,C:P=P+40
640 NEXT
650 PRINT"□"
660 PRINT"■ARGHH !!!!!"
670 PRINT"■YOU'VE JUST CRASHED INTO A SKYSCRAPER  OR HAD'NT YOU NOTICED "
680 PRINT"■THAT'LL TEACH YOU TO BOMB US AGAIN!!"
690 PRINT"STILL YOU ESCAPED DID'NT YOU "
695 PRINT"■ YOU LASTED "RIGHT$(TI$,3)" SECS"
700 PRINT"■■NO !!■ HA HA HA !!!"
710 PRINT"YOU'VE JUST BEEN ARRESTED FOR RECKLESS  DRIVING !!!!! "
720 PRINT"┌──────────┐"
730 PRINT"│!!  ■■■■!!!!
740 PRINT"│!!■.  .■!!!!
750 PRINT"│!!■  ■ ■!!!!
760 PRINT"│!!■  ■ ■!!!!
770 PRINT"│!!'──'■!!!!
780 PRINT"└──────────┘"
790 PRINT"PRESS ■E■ TO START,OR ■E■ TO END"
800 IF PEEK(151)=40 THEN RUN
810 IF PEEK(151)=63 THEN 2100
820 GOTO800
1000 PRINT"□          INSTRUCTIONS
1010 PRINT"■ BOMB THE CITY TO LAND YOUR PLANE"
1020 PRINT"YOU HAVE AS MANY BOMBS AS YOU WANT"
1030 PRINT"■ AS LONG AS YOU WANT"
1040 PRINT"BUT  YOUR PLANE IS LOSING HEIGHT QUICK"
1050 PRINT"AND SO EVERY BOMB COUNTS !!!!"
1055 PRINT"■USE ■SPACE■BAR■ TO DROP A BOMB"
1060 PRINT"■GOOD LUCK"
1070 PRINT"YOU'LL NEED IT !!!"
1080 PRINT"■ANY KEY TO START"
1090 GETA$ IFA$=""THEN1090
2000 RETURN
2100 PRINT"□"
2110 FORR=1TO1000:NEXT
2120 PRINT"■■■■■■■■■■■■■■■BYE-BYE FOR NOW!!"
2130 FORR=1TO1000:NEXT
2140 PRINT"□":END
3000 PRINT"□"
3010 PRINT"■■CONGRATULATIONS,YOU'VE DONE IT"
3020 PRINT"YOU ARE NOW GOING TO BE MOVED TO A"
3030 PRINT"CITY WITH TALLER BUILDINGS"
3040 D=D+1
3050 PRINT"HIT ANY KEY TO RELAUNCH"
3055 FORN=1TO500:NEXT
3060 GETA$ IF A$="" THEN 3060
3070 GOTO  6
READY.
```

VAT returns, and a number of other features.

The progam originally surfaced on the Commodore 8000 series, and has been stripped down a little to fit onto the 64. Nonetheless, it still meets up with the requirements of the Simplex 'D' cash book (ask any newsagent what that is, if you don't know), and at £150 is well worth looking at.

Another old favourite, revamped from an original PET version, is **Petspeed** an optimising compiler of Basic Code. Presumably it should now be called 64 Speed.

They claim to be able to compile any program written in Basic, and end up with a program that can run up to 40 times faster. Certainly we've never experienced any problems in running it, and to see the increase in execution speed of (say) Adventure is a major revelation.

It definitely falls into the category of "how did I ever manage without it", and there aren't too many programs that you can say that about.

This one is available from Oxford Computer Systems (0993 812700), and will set you back £125.

Fortunately, there is more than software to look at, although everything at present seems to be working on the VIC and under development for the 64.

Time will tell, and it's worth making enquiries of any of the companies we mention here for the latest information.

Low Cost MicroDrive

Memory expansions; joysticks, motherboards and the like are being produced by too many companies to name here, so we'll turn our attention to the most interesting development of all, the MicroDisk Drive.

Priced at £180 for a single disk version, and £275 for the half-megabyte twin disk system, Bill Musker of NCI-Ltd (01-349 4713) was quoting a delivery date of mid-June for the 64 MicroDrive.

This, of course, coincides with that annual extravaganza the PET Show, or whatever fancy name Commodore choose to give it this year.

For VIC 20 users the picture is more rosy, with a working model being on display at the recent VIC and Commodore 64 Users Show, and an anticipated delivery date of mid-April.

As a low cost alternative to existing disk drives, and without the added expense of buying (if you can get hold of one) an IEEE cartridge, I think NCI could be in for a busy year.

So, the scene is not as bad as you think it is. There is software and hardware available, with the promise of much more to come in the next few months.

This leaves just one missing area: documentation, and here the story is grim. We don't know of any book, other than the appalling manual that comes with the 64, which will give you even the faintest glimmer of hope for programming and controlling the machine.

But if its software and hardware you're after, hopefully, the above should lighten your wallets somewhat in the coming weeks. We'll be back next month with another look at the VIC 20 and Commodore 64 scene.

ALPHABET SOUP

B.M. Phillips sent us this game for the unexpanded Vic 20 computer.

Two sets of letters are hidden beneath dots. Each dot can be lifted by moving the cursor to it with the F key and then pressing the S key.

Only two dots can be raised at any time, but if the letters revealed match, then they stay on display.

The object of the game is to reveal all the matching pairs is the shortest time possible.

Good luck!

```
 1 DIMP(56):DIMD(56)
 2 S1=1
 3 RN=RND(-TI)
 10 PRINT"■"
 12 PRINT"■■■■■ALPHABET SOUP"
 15 PRINT"■■■■■■THE SOUP IS BEING MADE"
 18 PRINT"■■■■■■■WHEN IT IS READY FIND  ";
 19 PRINT"THE LETTERS"
 20 PRINT"■■■■■■■■■■■■F TO MOVE  ↑"
 21 PRINT"■■■■■■■■■■■■■■■S TO SEE THE LETTER"
 22 FOR I=1 TO 10
 25 PRINT"■■■■■■■■■■■■■■■
```

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ATM 26	Atom New Power Supply 1.8A	9.66
ATM 21	Floating Point ROM for Atom	21.85

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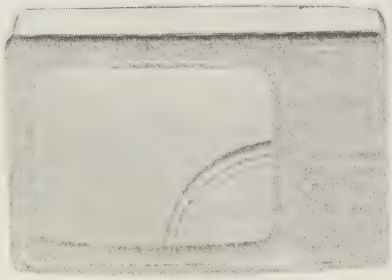

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BBC Micro

Asteroid Belt

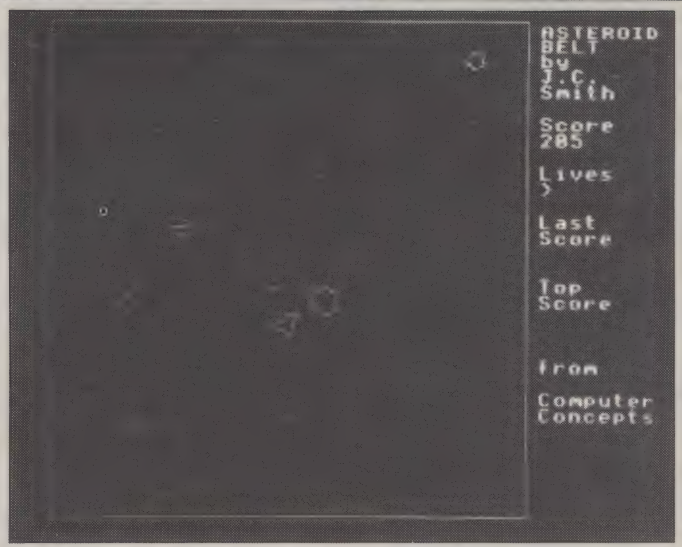
Also known as **Asteroids** this program is one of the oldest computer games, and has now appeared in several forms for the BBC Micro. The Computer Concepts variation has all the standard features — a space ship which can be revolved to shoot at, and hopefully destroy approaching asteroids, the ability to move the ship to dodge them and a 'hyperspace jump' to leap out of the way if the going gets rough!

Occasionally, a hostile ship floats by, hurling laser bolts at your craft, and you score extra points for blowing it up.

The game starts at a sedate pace, which makes it all the more infuriating when the meteor storm hots up and the inevitable collision occurs! The program is written in machine code and responds well to the keyboard, although the spaceship is a little slow to turn.

There is an option for the use of joysticks, and sound is carefully used, so it won't drive the neighbours mad when you become addicted to the game.

Asteroid Belt £8.97 from Computer Concepts. BBC Model B.



Computer Concepts Asteroid Belt.

Personal Acornsoft

Acornsoft's **Desk Diary** cassette contains two programs aimed squarely at the home user with business aspirations. The Diary itself, known as a **Planner**, looks after appointments, while **Address Book** is what its name suggests — a simple database storing a number of records alphabetically.

Each record consists of a name, address, postcode and telephone number. It is possible to amend the entries and space is provided in each for extra information which can be used for coding them.

This is a useful feature as it allows selective searches (e.g. for mailshots or for finding birthdays by the month) and the program will display all or part of the required files on screen with optional output to a printer.

If more than one file is to be set up it is necessary to use a different cassette or disc because the file name used by the program cannot be changed.

Anyone needing a personal secretary at home may be pleased with Acornsoft's Planner. It displays an appointments and reminders diary on screen and uses the computer's built-in clock to give an alarm at the time of each appointment on the day of use.

The program looks after single entries or recurring commitments and 'unavailable' days. It is easy to page forwards and backwards through the diary and review future reminders such as holidays and bill repayments.

A "coming soon" option shows all the entries in the diary for up to 30 days. Like Address Book, the contents of Planner can be saved or loaded on cassette or disc.

Both programs are well laid out in the teletext mode and have good control over the input of data. Definitely for home users, but quite interesting and good value at £9.95 for the pair.

Desk Diary — £9.95 from Acornsoft. BBC Model A or B.

Character-forming

This handy utility enables BBC Micro owners to define the 32 spare characters available in the machine's graphics modes. When run, the program produces a large 8x8 grid on the screen, within which a flashing cursor is moved using the normal cursor keys.

Pressing the space-bar will cause the current square on the grid to be filled in, and the corresponding element to be added to the character definition.

Characters uses the BBC machine's VDU 23 command, which requires eight parameters, and as each character is built up the parameters are shown to the left of the grid in case the user wants to make a note of them to incorporate them in new programs.

The program will define characters in the range 224-255 and the complete set is tabulated normal-size on the right of the screen. The cassette comes with a sample set and useful advice for saving and loading the definitions. 'Characters' is very easy to use, and senses the type of machine running it, automatically switching to Mode 1 on a Model B or Mode 4 on a Model A.

Characters — £6.67 from Computer Concepts. (BBC Model A & B)

Snake

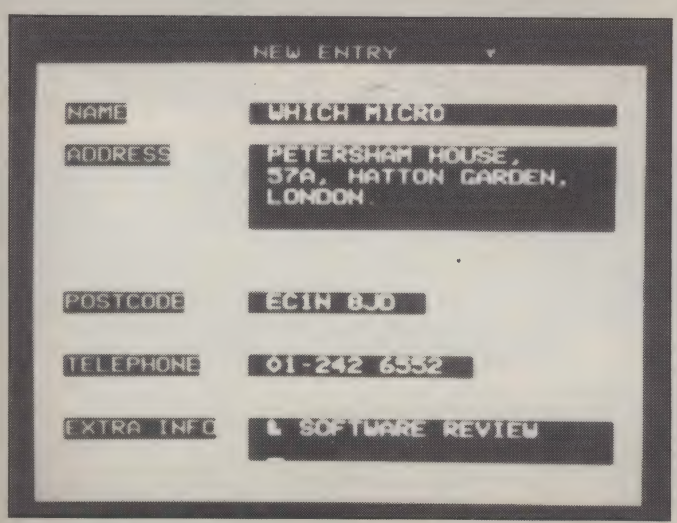
Here, the player is in control of a snake which has to gobble up various items of 'food' appearing in its 'cake'. The snake will chug forwards at a steady pace unless guided to left or right to snap up a tasty morsel, and as it eats it grows longer and moves faster.

From time to time, particularly nourishing chunks flash up on the screen, but they don't stay long and it is best to use an accelerator key to make sure you don't miss them.

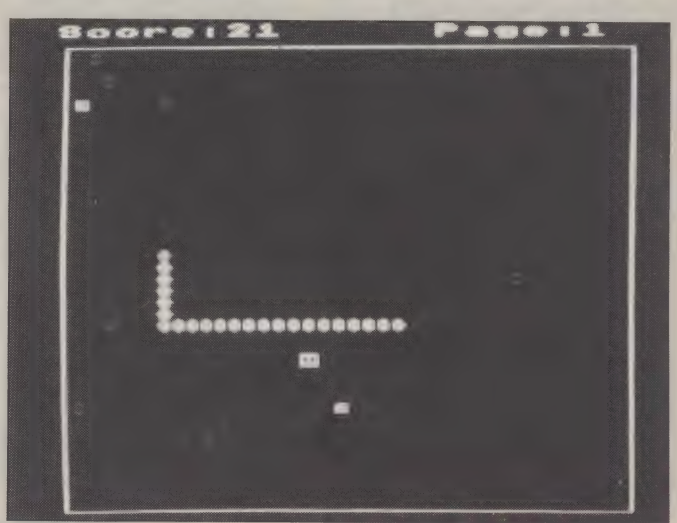
The object is to eat as much as possible, but a fair degree of co-ordination is required to use the left and right keys when guiding the hungry reptile down the screen, and there are three inevitable hazards in the game — hitting the cage wall, eating the nasty electric green squares and eating yourself by mistake. Needless to say all result in death!

A player's league table shows high scores at the end of each turn, encouraging people to use the computer in groups. Snake is a colourful game, and is difficult to stop playing.

The Snake — £8.97 from Computer Concepts. BBC Model B.



Acornsoft Desk Diary.



Computer Concepts Snake.

At last. A range of software that's as well designed as the Dragon 32.

Six months ago, most computer users thought a Dragon was something out of an adventure game.

How times change. Nowadays, it's almost impossible to pick up a computer magazine without reading some new tribute to the Dragon 32.

THE FIRST FAMILY COMPUTER

We called it the first family computer. And we believe that much of its success derives from the fact that it has been superbly designed for the job it has to do.

Design that incorporates 32K RAM of memory at a real value-for-money price level.

Design that utilises the advanced 6809E microprocessor.

Plus a range of features that help make the world of computers accessible to first-time users. Like colour drawings. 5 octaves of music.

And plenty of power and versatility to keep up the interest as your experience increases.

SOFTWARE TO MATCH

Designing a range of software that does justice to the Dragon was a task we approached with as much care as designing the computer itself.

The results are now available - games, educational programs, hints on programming - conceived by some of the best software houses in the world, to help users get even more out of their machines.

*TV not included in price.

Graphic Animator. A cassette that makes use of the Dragon's ability to draw on the screen. It shows you how to create simple cartoons - then bring them to life.

Personal Finance. This cassette allows you to keep track of all the family's finances, from bills to bank statements.

Ghost Attack. On cartridge. You're in a maze, and you must find your way out. But you're not alone - you're pursued by ghosts!

Chess. A great partner to play against again and again - with one major drawback. It's very hard to beat. Test yourself against nine different levels. On cartridge.

Typing Tutor. Only a keyboard as sophisticated as the Dragon's could allow you a program like this. You use the Dragon's own keyboard to learn to type. On cassette.

Cave Hunter. Finding the hidden gold is hard. But surviving the attacks of malevolent creatures may well prove to be impossible. Cave Hunter is on cartridge.

Dragon Selection. A cassette of utility programs, allowing you to create your own database. Write your own tunes - or learn other language vocabularies.

Starship Chameleon. A cartridge game. You find yourself under attack by the dreaded Gabolators! Their task is to take your planet - yours is to protect it.

Computavoice. This cassette actually enables your Dragon to speak to you.

These are just some of our titles, and every month, we'll be adding more and more.

What you get out of a computer depends on what you put in. And with a Dragon 32 and Dragon software, there's enough challenge and satisfaction for anyone. But then, that's what it's designed for.

DRAGON 32

The first family computer.

SOFT RELEASE

Commodore

Our first reviews of software for the 64 include Hitch-Hiker's Guide

As most of you who own a Commodore 64 will be aware, there is a dearth of software for that particular machine. Many programs are promised from Commodore themselves, and from others such as Supersoft, but as yet few have appeared.

Consequently, any program that does come on the market is worth more than a passing glance. One of the first to appear is an adventure game called **Hitch Hikers Guide to the Galaxy,** available on cassette from Supersoft at a price of just £12 plus the ubiquitous V.A.T.

Weighing in at just short of 20K of Basic code the program takes a fair while to load, so while it's doing that and you're staring at a blank screen you might as well make a coffee and then settle down for a reasonable session of adventure playing.

All games of this sort have to measure up to the original Adventure game by Crowther and Woods, running on a DEC PDP 10. An abridged version of the game was produced by Jim Butterfield for PET disk, and as such gained widespread fame, producing many a sleepless night along the way as you battled with trolls, fought off dwarves and waved black rods about.

To date no-one has produced an adventure game that can even begin to be spoken of in the same breath as Crowther and Woods, and alas Hitch Hikers Guide to the Galaxy is no exception.

It is not bad, oh no! Any piece of software for the 64 must be looked at, and cannot be missed out of hand. However, Hitch Hikers (I'm not typing out the whole name every time!) has a number of factors running against it.

First and foremost is that it originally surfaced as a game for the old 40 column PETs, and to take advantage of the superb graphics and sound of the 64 we see the addition of four POKE commands and two control characters hardly a major contribution.

Secondly, like most adventures in Basic, it is a bit slow to respond at times, and has a relatively limited vocabulary.

Adventure games usually understand two word sentences like GO NORTH (often you can just type in the single letter N), CLIMB TREE, DRINK WATER, and so on, and part of the enjoyment of the game is a singular conviction that you have yet to discover every word that you can enter.

However, when just about every other command meets with the reply 'Sounds fun, but my programmer was too dumb even for Sirius Cybernetics' one soon begins to despair. Similarly, replies like 'I didn't hear you — do what', and the depressingly cheerful 'Sorry Guys, no can do!', rapidly get on your nerves.

Despite all that, Hitch Hikers is not without compensation. The people who will gain most enjoyment out of this program are the ones who are already addicted to the Hitch Hikers tales from radio, television, books, and the like.

Phrases like Pan Galactic Gargle Blaster, references to Vogans and White Mice are liberally sprinkled throughout the game, but it's all somehow a little thin — no meatiness to the game at all.

You start off in the high street, with no instructions as to what you have to do.

Like nearly all adventures you would do well to try and follow the norm, explore as many places as possible and acquire as many objects as possible.

A quick trot up the road and you find yourself in the Five Artefacts Inn, no doubt enjoying the aforementioned Pan Galactic etc., with a bowl of petunias and a poster close to hand.

The abbreviations for movement mentioned earlier certainly save time here, but it's a shame that there is no south east, north west, and so on. You're limited to the four cardinal compass points, and up and down.

Exploring around you soon come across Vogan Battle Cruisers, Heart of Gold spaceships, with the Total Perspective Vortex to totally confuse you — all adventures must have a maze of some sort!

Before too long you'll be finding all your favourites, Marvin the Paranoid Android, Megadonkey stakes, the Restaurant at the End of the Universe, and many, many more. Above all, DON'T PANIC!!

I won't tell you how the game ends, principally because I've never got there, but you probably don't need more than 42 guesses to figure it all out.

An enjoyable romp, particularly if you're devoted to Hitch Hikers, and at £12 it is not bad value. But, it does have its shortcomings, and is certainly not the best game you'll ever see on a Commodore 64.

As a piece of 64 software it's worth a visit to your local dealer, and if you're the sort of person who can afford to spare £12 you could do worse. On the 64, at the moment, you can't really do any better! Supersoft, are on 01-861 1166.

Hitch Hikers Guide to the Galaxy — Price £12.

Synth 64

The one problem with reviewing a musical program such as this is that everyone rapidly grows tired of listening to you! However, **Synth 64,** available in this country from Adamsoft, does provide some consolations.

With the majority of software that is currently available for the Commodore 64 you'll probably find that very few of its many features are actually being used.

Sprite graphics have certainly not been exploited to their full potential, and neither has the revolutionary SID (Sound Inter-face Device) chip yet been heard properly.

Synth 64 is the first program so far that makes any attempt to use either of these two features, and it is SID that we are concentrating on here.

Put simply it is a music and sound synthesiser for the 64, which makes composing an awful lot easier.

You don't have to remember a whole host of POKE commands, for instance, you don't have to know anything about filters and ring modulation, and you don't really have to know that much about music either.

On loading and running the program, you have the option of loading in a number of sample tunes, and it's probably worth doing it to see what kind of effects can be created with the program.

Moonlight Sonata leaves a little to be desired, and the Battle Hymn of the Republic is presumably there because the program originated in the States.

With 'Battle' you do get a chance to see one of the programs many features in action, that of trace, which shows you precisely what is happening as the music is being played.

The final example, Beer Barrel Polka, was a clear winner. Sounding like a cross between Chas 'n' Dave and Jean Michael Jarre, it produced a reasonable impersonation of an accordion as it rocked through the number.

Having had a listen, you can start to use the program properly.

Synth 64 takes up about 5K of code, leaving you some 33,000 bytes of Basic to compose your masterpiece. By adjusting memory pointers it effectively 'sits' in the machine and allows you to type in your tunes.

These are entered as simple Basic programs, using the existing 64 text editor, but with a number of enhancements to the built-in Basic.

The '@' symbol is the key to it all, as, in conjunction with other commands, it allows you to 'play' banjos, flutes, pianos and the like with commendable accuracy.

All told, there are about a dozen additions to standard Basic — wait, repeat, display, and so on, with amendments to existing commands to make musical composition easier. For instance, input select works like an ON . . . GOTO would in normal Basic. If you input 1, you go to the first line specified, 2 and you go to the second, and so on.

The simplicity of composing with Synth 64 can readily be appreciated by a look at the tone generator commands. @ An, for example, sets attack speed. @ Dn similarly sets the decay speed, where n is a number between 0 and 15. All the '@' commands work in this manner.

Some of them can be made to work on more than one voice at a time, so true chord sequences can easily be built up.

All of this is succinctly explained in the manual that accompanies the program, although one would like to have seen rather less spelling mistakes in there.

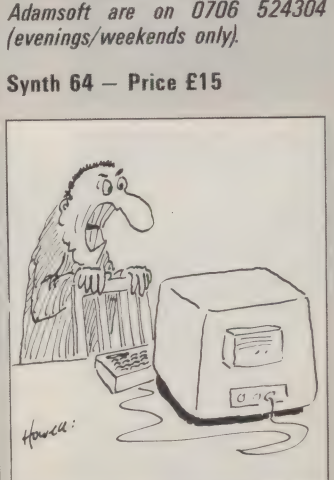
Still, the numerical data is correct, and so for that we must be grateful.

Throughout, the descriptions of the various functions in Synth 64 are followed by short programmed examples so that you can see (or rather hear) them in action. Also, most of the major musical functions in SID, like waveform, pitch, envelope generation, are given a brief explanation so that you know what you're playing.

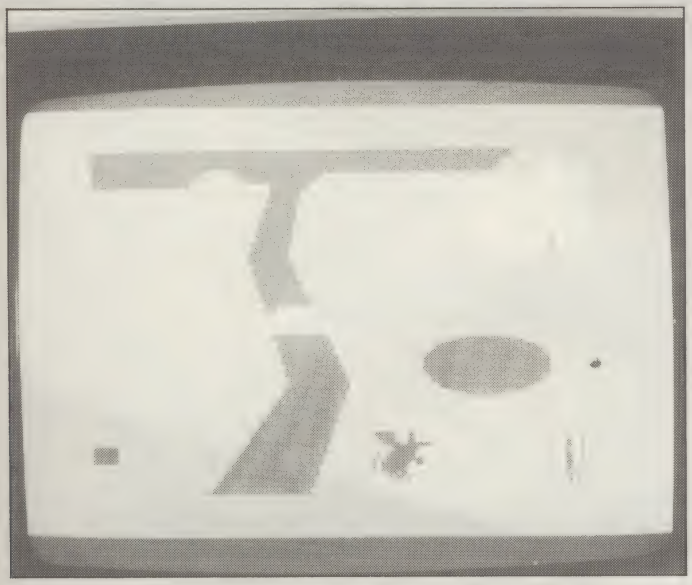
The program was written by a musical enthusiast who was excited by the possibilities contained within SID, and who subsequently found on receiving his 64 that the manual fell far short of explanation of things musical. The basics were there, but everything was so complex! Consequently, he set about writing his own program to control everything, and this was the result.

As well as being musically talented Roy Wainwright is also a good programmer, as Synth 64 amply demonstrates. For anyone who has a Commodore 64 and has the slightest interest in music, it's worth tracking down a copy of the program. Adamsoft are on 0706 524304 (evenings/weekends only).

Synth 64 — Price £15



What d'you mean "Work it out yourself"?



Saint George and the Dragon by CRL

Dragon 32

Saint George and the Dragon

If you have trouble loading this, don't blame the tape, it's probably your Dragon 32 making a protest, for you are the noble St George and one of your tasks is to smite the fire-breathing dragon that stands between you and the magic stone.

There are four levels of play, and you have five lives, even if the cassette insert does say five levels and three lives. The screen presents you with a castle in the top right, where various fair maidens are held captive.

Below that is a lake, with a matchstick St George at bottom right. In the bottom left hand corner is your target, the red magic stone.

Down the middle winds a river with a slippery bridge, and somewhere on the screen will appear a very well-drawn red dragon, which immediately heads towards you. The graphics, with the exception of St George, are impressive.

A joystick is essential, and with this you must move St George across the river to the red stone, smashing this with your sword to release the maidens.

The fire button activates the sword, and you soon learn that it's best to face the dragon and kill it, as crossing the river and hacking at the stone are both tricky manoeuvres requiring not a little time and skill with the joystick.

The tactic is to lurk out of the dragon's range till he breathes fire, then leap in and kill him before he breathes again — needless to say, fire doesn't do much for a knight in shining armour.

Slaying the dragon gives the game's best effect, as the beast then bleeds rather messily all over the floor before disappearing.

Having avoided being barbecued, you must also avoid drowning, but once across the bridge you are free to smash the stone, and it's here that my reservations about the game begin. Achieving your objective scores you one point, and you start again, your lives intact.

Five lives gone and you get a grading according to your score — and game speeds up slightly as your tally of dead dragons mounts. It is a pity, however, that, having gone to so much trouble to produce impressive graphics, the compiler doesn't give you much of a reward — not even so much as a glimpse of the fair maidens we've been risking death for.

Having said that, though, Computer Rentals have produced a game that is a little different from the run-of-the-mill variety, and we can well imagine this appealing to children, who'll probably love the bleeding dragon, if you'll pardon the expression.

St. George and the Dragons — Computer Rentals £6.95.

Shards games packs

If you can't judge a book by its cover, you can often judge a software package.

These simply but professionally presented tapes from Shards suggest no-nonsense programs, and that's exactly what you get, ten per tape. Each program starts the same way, giving you the option of detailed instructions, a habit all companies should get into.

Fun and Games begins with **Noughts and Crosses** at two levels, though as the computer always responds the same way, the hard level soon becomes easy. Youngsters might find it trickier, though.

Brain is an almost adequate Mastermind, but with an annoying little bug. If you don't guess the four hidden colours in ten attempts, the correct solution isn't displayed. Looking at the listing shows there is a line for this, but since it's immediately followed by a line printing 'Another go?' in exactly the same place you'd need pretty good eyesight to spot it.

After line 2050 to read print @ 480 instead of Print @ 448 but be careful saving the altered program as you only get them on one side of the tape.

Gold needs joysticks to weave through a minefield collecting bags of gold to the rising tones of the Dragon's 255 musical notes, producing a healthy feeling of panic towards the end.

You play **Snap** against the computer, the cards displayed in high-resolution. Another one for the youngsters, I think — and there's no arguing with a Dragon.

My own favourite was **Anagrams,** giving you eight jumbled town names to solve from a wide selection, with a shuffling facility if you're stuck. Harder than it looks — well, you try spelling Aberystwyth at eleven o'clock at night.

Donkey is an amusing computer age version of "Pin the Tail on the Donkey" though again you need joysticks as a rising or falling tone guides you while blindfolded. Great fun, but it would be nice to have a tail displayed for a while so the victim could see what embarrassing place they'd chosen.

Dice is a poker-dice game, you against the clock, while **Circles** tests your memory in matching circles of different sizes and colours.

Any number can play **Artist** each one giving the computer instructions as to the type of painting to be done, and either the contestants or the Dragon can judge the winner at the end, though there seems little difference between the best and the worst in this random art generation.

The tape finishes off with **Musical** which uses the motor on/off function to control a music tape while everyone plays musical chairs.

A good all-round package, then. Less impressive is **Family Programs,** but as the title suggests, this is meant to have something for everyone.

Joysticks are needed for **Battle,** a painfully slow-moving tank battle which might better be called Snails.

Maths uses a high-resolution display to test your mental arithmetic while an egg-timer runs out in the top corner of the screen. Three levels, and interesting to see that the graphically-drawn numbers do appear almost instantly.

Tunes is a "Name That Tune" quiz game where the opening notes of a song are played, not always at the correct tempo. A good game, though the compiler has gone adrift in choosing the five categories of songs: if 'Cockles and Mussels' was a sixties hit then I missed it, and I didn't know 'Pinball Wizard' and 'Paint It Black' were traditional songs, either.

Finance is a mortage and savings calculation program, telling you what you can afford, monthly costs and so on. I fed in my own details and was told 'Impossible Calculation.' So much for the life of the freelance writer!

Quiz tests your brains over five subjects chosen from a selection of 15, and although good, it does demonstrate the perils of writing a quiz program. 'With what do you associate a corrida?' A bullfight, yes? Wrong: "Bullfighting" is the one and only answer. You'd get more sympathy from Magnus Magnusson.

Sarah is Simon in drag, **Ringo** doesn't ask you to play the drums but to manoeuvre a ring along an electrified wire, while **Oddjob** includes small programs of limited appeal. **Reactions** sees how quickly you can match a letter on the screen with the keyboard, **Smiler** asks you to track a smiling face with a cross and try to bop it on the nose, and **Etch-a-Sketch** uses the joystick to draw on the screen.

The fourth program is **Day of the Week,** and if you've been counting that should make eleven on this tape, not ten as I said, but **Day of the Week** gets the booby prize of the month.

This purports to tell you on what day of the week any date in the twentieth century falls. As a start, I typed in that day's date. Friday, it told me, which was strange as ever since getting up I'd been under the impression it was a Saturday.

So I typed in 29th February, 1983. Monday, it said. Back to the drawing board with that one, Shards. A program which doesn't perform the one function it's meant to is about as much use as a teapot without a spout.

Still, at only 60p per program, these tapes do give you good value for money — and they often do say that computer people don't know what day of the week it is!

Dragon Fun and Games and **Dragon Family Programs — Price £6.**

Dragon Golf

This is a simple version of golf, in low resolution, but is no less for that. Having chosen the One or Two-Player option — the latter includes a handicap system — the screen quickly fills with gorse bushes, trees, bunkers and lakes, and information about the hole is printed along the top and bottom.

66

The length of the hole varies randomly between 100 and 590 yards (as a glimpse at the listing shows). You are also told the par for the hole and the wind direction. You select the direction of your shot by typing in a number, as on a clock face, and then the strength, from 0-250 yards.

Then, as with the real thing, you hope for the best. Although only in Basic, the game operates very quickly indeed, and you soon discover that you've lost the ball in the lake yet again.

The various obstacles you're presented with behave as they might in reality: you may or may not get out of a bunker first time, the wind will drop just when you've allowed for it.

Even when you're sure you've got everything right, the ball will still slice off into the rough on occasion. But there are also the compensating pleasures, like sinking a 60-yard putt.

It incorporates those ingredients that make a good game: each hole is different, you need both skill and an amount of luck, it responds quickly, and there's built-in incentive to do better.

With its well-designed and informative cassette insert, and its reasonable price, it's hard then to see how this game could be improved — apart from the computer buying you a drink at the 19th, of course, but maybe that's asking too much.

Handicap Golf — Computer Rentals £6.95.

Spectrum

Schizoids

The most colourful pages in some micro magazines are the advertisements, and no company has done more to encourage this trend than Imagine, the Liverpudlian software house which recently broke away from Bug-Byte.

Multi-page spreads featuring their new game Schizoids have emphasised the nail-biting tension experienced as a result of playing, but the game itself proved less than gripping.

The player's aim is to push various objects into a "black hole" in the centre of the screen, while avoiding that fate himself.

The threatened parcels of nastiness duly arrive in the form of geometric wire-frame models which tumble slowly around the arena. Trouble is that they all tend to vanish into the ever-hungry hole without human interference, and the point of the game thus seems hard to grasp.

Although the 3-D rotation of the cosmic refuse is quite impressive as a feat of programming, the game induced a general feeling of "is that all it does?" in those who took part.

To be fair, the game is of acceptable commercial quality, but one would expect something rather more impressive from anyone sufficiently confident to advertise "a breath-taking visual experience . . . the assault on your senses has begun!"

Perhaps we should all be grateful. After all, if every game lived up to its advertising there would be no need for reviewers!

Schizoids — Imagine Software £5.95.

Atari

New cartridge games

Remember **Track Attack** to which I gave the Atari Column's first five star award. It has now been joined by another program, **Miner 2049er.** Once again this game really has the lot. Great graphics, staying power and a gradual increase in difficulty level.

The story so far . . . Bounty Bob is a mounty hot on the trail of the ruthless fur trapper Yukon Yohan. Yohan has lured Bob into an old disused Uranium mine.

But due to a cave in both are sealed inside the mine. Bob must move through ten mine *stations* in pursuit of Yohan and the exit. Scattered about the mine are mutant organisms that will kill Bob at the slightest touch.

But fear not, at various points throughout the mine are tools and food left behind by the old miners.

If Bob touches these he gets bonus points and the chance, for a short time, to touch and destroy the mutants.

The ten screens consist of various combinations of framework and special equipment. As Bob walks over the framework it turns to a solid colour.

Bob must turn all the framework to this solid colour to progress to the next screen. Each screen has some special sort of obstacle or equipment.

For instance two screens have transporters which beam Bob up to a different level. Other specials include slides, radio-active waste, lifts and pulverizers.

On the last screen Bob has to collect TNT and play at being a human cannonball to get to different screen levels.

Miner 2049er is on ROM and has possibly the best graphics I have yet seen for the Atari. The game itself is superb and it will take many hours of play to attain level ten.

Three more ROM's have become available from Atari. They are **Galaxians, Defender** and **Quix.** All are exact replicas of the arcade games.

Galaxians was the game that I started video gaming on. That was over two years ago and games have come a long way since then.

Perhaps this ROM is a little on the late side arriving. Defender is a game that still captures the imagination of the best video gamers.

It needs a fair amount of dexterity to play and only those with lightening reactions will get very far into this game.

Quix is a slower game but do not think any the less of it for that. You must build blocks on the screen using the joystick.

Your main aim is to capture the Quix. At the top of the screen is a readout which will tell you of the amount of screen that you have covered.

Once you have covered over 75% the game progresses to the next stage. You will score more, however, if you can capture the Quix and reach over 75% at the same time. Bonus points are awarded for each percent over the 75% threshold.

I quite enjoyed playing this game and to my tastes it is possibly the best of the three.

Atari will also be issuing more cartridges during the course of the year. Look out for Dig Dug, mPhone Home E.T. and a new word processor package.

The new 5200 games machine is, in reality, a stripped down 800 so maybe there is a possibility of Gravitar, Kangaroo and Jungle King becoming available for the computers.

Pole Position, Atari's great new race game in the arcades, is slated for 5200 release.

This is one game that I would really love to see on the computers. If you have not had a chance to play it look out in your nearest arcade.

CP/M Utility

Decision Point Operating Guide

CP/M has been dubbed the Ubiquitous Pig — a title which reflects both its position as the most widely used computer operating system and the intractable face it presents to the user.

One palliative to the system's unfriendliness is Decision Point Operating Guide, a new introduction from Decision Systems. It does not replace CP/M, but sits on the top of it like an insulating tea-cosy.

The manufacturers describe their aim as "anaesthetizing CP/M" and the description is appropriate. Loading the guide, the user first enters a review section which gives a lucid account of how to operate the guide. It is well to pay attention since no paper manual is provided.

Once the principles have been mastered however, it is possible to instruct the guide to skip the review section in future. The next stage, entering the date, is compulsory, because the guide keeps a record of diskette backups. The user decides how frequently he should make copies of his important files, and the system then reminds him to back up when the time comes round.

The guide then proceeds to the main menu which contains seven facilities — Finish, Review, Supplies, Maintenance, File Management, ID/-Change and Back-up.

The Maintenance section allows the user to amend or delete existing facilities, and to introduce new ones. The ability to add facilities of one's own is useful, especially since they can have names of up to 15 characters and descriptions of up to 35.

But the real value of the guide lies in its ability to orchestrate and simplify routine disk housekeeping. The file Management facility replaces the DIR and PIPS of CP/M, providing a catalogue of disk status, with files being indentified by name, type size and number of records.

Selective copying of individual files is simplified under File Maintenance. The user strikes off a displayed list until the only ones left are those to be transferred. The transfer command then simply copies these files on to another disk.

The identity given to a file by the ID/Change facility is the key to the System Manager. When the operator calls a file which is not on any of the diskettes actually in the computer, the System Manager indicates on which of the disk library the required file can be found.

The guide does not protrude into precious user RAM in any noticeable way, since as soon as a file is loaded the guide exits from memory.

Decision Systems have produced an elegant solution to many of the difficulties encountered when using CP/M. The discipline imposed by the back-up facility is particularly impressive — when did you last copy an important file which may have been nearing the end of its life?

The guide is expected to be supplied pre-installed in system software and a number of manufacturers have adopted it as original equipment. When bought separately the price is £40. Versions are available for most CP/M computers.

PROGRAM COMPETITION

The response to our program competition has been even more prodigious than we expected, and to give every entry a fair assessment will take a few weeks.

We have decided to print a few of the better submissions in our listings section this month, at our usual rates.

If all goes according to plan, we will announce the winner in our July issue.

MAKE YOUR CONTRIBUTION TO SPECIAL EDUCATION MORE EFFECTIVE

Robyn Frankham copes very well with her learning problems, thanks to developments with computers in special education. Like many other children, she now has the ability to communicate with the aid of microelectronic devices which help her to write essays, draw pictures and most important of all, to gain her independence.

Learning To Cope '83 — Computers in Special Education, is the second of this annual publication which presents the story of Robyn and how many other physically and mentally handicapped children and adults are coping with their futures. Tremendous progress is being made through the manufacture of specialised devices and through the dedication of teachers and parents.

Learning To Cope '83 looks at specialised computer hardware and software and brings you the latest developments in applications covering all aspects of special education. Read for yourself how committed people have developed and redesigned new and existing equipment to help those in special education help themselves.

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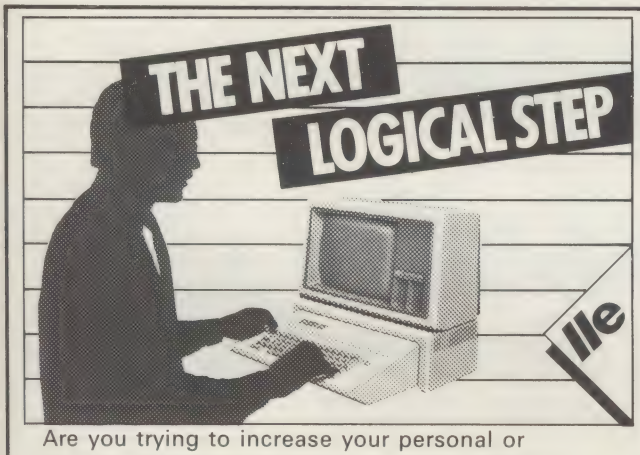

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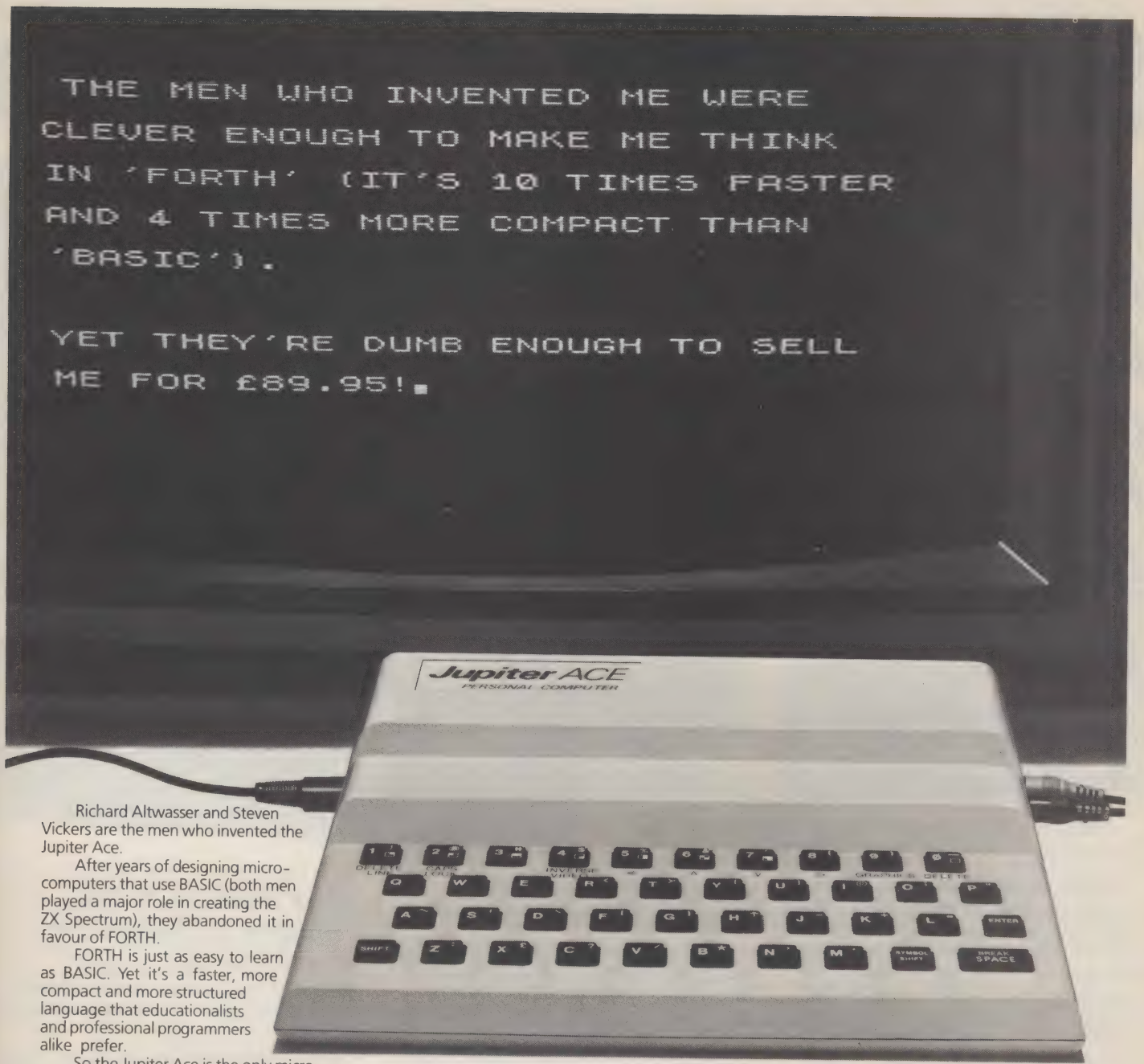

Richard Altwasser and Steven Vickers are the men who invented the Jupiter Ace.

After years of designing micro-computers that use BASIC (both men played a major role in creating the ZX Spectrum), they abandoned it in favour of FORTH.

FORTH is just as easy to learn as BASIC. Yet it's a faster, more compact and more structured language that educationalists and professional programmers alike prefer.

So the Jupiter Ace is the only micro-computer you can buy that is designed around FORTH.

Using it, there's little fear of accidentally 'crashing' programs halfway through and having to start all over again (a common fault with BASIC). The Jupiter Ace's comprehensive error checking sees to that.

The Jupiter Ace has a full-size keyboard, high resolution graphics, sound, floating point arithmetic, a fast, reliable cassette interface, 3K of RAM and a full 12 month warranty.

You get all that for £89.95. Plus a mains adaptor, all the leads needed to connect most cassette recorders and T.V.'s, a software catalogue (35 cassettes available, soon to be 50), the Jupiter Ace manual and a free demonstration cassette of 5 programs

The Jupiter Ace manual is a complete introduction to personal computing and a simple-to-follow course in FORTH, from first principles to confident programming.

Plug-on 16K and 48K memory expansions are also available, at very competitive prices. (There'll be a plug-on printer interface available soon, too.)

It'll take you no time at all to realise how clever Richard and Steven were to design the Jupiter Ace around FORTH. And even less time to realise what a silly price £89.95 is to charge for it.

Technical Information

Hardware
Z80A; 8K ROM; 3K RAM.

Keyboard
40 moving keys; auto repeat; Caps Lock.

Screen
Memory mapped 32 col x 24 line flicker-free display upper and lower case ascii characters.

Graphics
High resolution 256 x 192 pixel user defined characters.

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First, there was the world-beating Sinclair ZX80. The first personal computer for under £100.

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You have the facility to support separate data files.

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Yet the price of the Spectrum 16K is an amazing £125! Even the popular 48K version costs only £175!

You may decide to begin with the 16K version. If so, you can still return it later for an upgrade. The cost? Around £60.

Ready to use today, easy to expand tomorrow

Your ZX Spectrum comes with a mains adaptor and all the necessary leads to connect to most cassette recorders and TVs (colour or black and white).

Employing Sinclair BASIC (now used in over 500,000 computers worldwide) the ZX Spectrum comes complete with two manuals which together represent a detailed course in BASIC programming. Whether you're a beginner or a competent programmer, you'll find them both of immense help. Depending on your computer experience, you'll quickly be moving into the colourful world of ZX Spectrum professional-level computing.

There's no need to stop there. The ZX Printer – available now – is fully compatible with the ZX Spectrum. And later this year there will be Microdrives for massive amounts of extra on-line storage, plus an RS232 / network interface board.

Key features of the Sinclair ZX Spectrum

- Full colour – 8 colours each for foreground, background and border, plus flashing and brightness-intensity control.
- Sound – BEEP command with variable pitch and duration.
- Massive RAM – 16K or 48K.
- Full-size moving-key keyboard – all keys at normal typewriter pitch, with repeat facility on each key.
- High-resolution – 256 dots horizontally x 192 vertically, each individually addressable for true high-resolution graphics.
- ASCII character set – with upper- and lower-case characters.
- Teletext-compatible – user software can generate 40 characters per line or other settings.
- High speed LOAD & SAVE – 16K in 100 seconds via cassette, with VERIFY & MERGE for programs and separate data files.
- Sinclair 16K extended BASIC – incorporating unique 'one-touch' keyword entry, syntax check, and report codes.

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ZX Spectrum software on cassettes – available now

The Spectrum software library is growing every day. Subjects include games, education, and business/household management. Flight Simulation...Chess...Planetoids...History...Inventions...VU-CALC...VU-3D ...Club Record Controller...there is something for everyone. And they all make full use of the Spectrum's colour, sound, and graphics capabilities. You'll receive a detailed catalogue with your Spectrum.

ZX Expansion Module

This module incorporates the three functions of Microdrive controller, local area network, and RS232 interface. Connect it to your Spectrum and you can control up to eight Microdrives, communicate with other computers, and drive a wide range of printers.

The potential is enormous, and the module will be available in the early part of 1983 for around £30.

sinclair

Sinclair Research Ltd, Stanhope Road, Camberley, Surrey GU15 3PS.
Tel: Camberley (0276) 685311.

The ZX Printer – available now

Designed exclusively for use with the Sinclair ZX range of computers, the printer offers ZX Spectrum owners the full ASCII character set – including lower-case characters and high-resolution graphics.

A special feature is COPY which prints out exactly what is on the whole TV screen without the need for further instructions. Printing speed is 50 characters per second, with 32 characters per line and 9 lines per vertical inch.

The ZX Printer connects to the rear of your ZX Spectrum. A roll of paper (65ft long and 4in wide) is supplied, along with full instructions. Further supplies of paper are available in packs of five rolls.

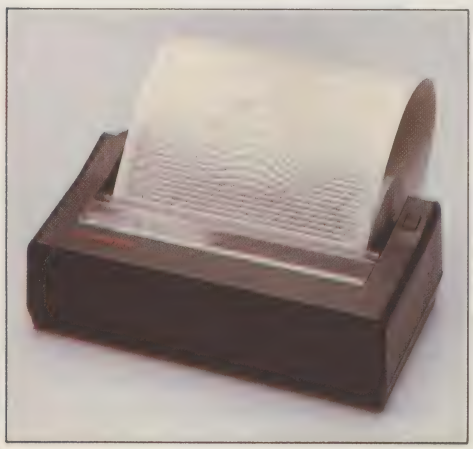
The ZX Microdrive – coming soon

The new Microdrives, designed especially for the ZX Spectrum, are set to change the face of personal computing by providing mass on-line storage.

Each Microdrive can hold up to 100K bytes using a single interchangeable storage medium.

The transfer rate is 16K bytes per second, with an average access time of 3.5 seconds. And you'll be able to connect up to 8 Microdrives to your Spectrum via the ZX Expansion Module.

A remarkable breakthrough at a remarkable price. The Microdrives will be available in the early part of 1983 for around £50.



How to order your ZX Spectrum

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EITHER WAY – please allow up to 28 days for delivery. And there's a 14-day money-back option, of course. We want you to be satisfied beyond doubt – and we have no doubt that you will be.

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	Sinclair ZX Spectrum – 48K RAM version	101	175.00	
	Sinclair ZX Printer	27	59.95	
	Printer paper (pack of 5 rolls)	16	11.95	
	Postage and packing: orders under £100	28	2.95	
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PERSONAL CLONES

The IBM PC is all set to be the new standard for business micros and their software. We take a look at some of the "compatible" copies which claim to offer a better deal.

A lot of people are buying – or thinking of buying – a desktop microcomputer at the moment as prices become more and more attractive.

Particularly interesting are the 16-bits offering so much more than 8-bit micros for an ever-diminishing price difference.

For under £2,500 you can now buy desk top systems offering larger memories, multi-user capability, multi-tasking and more sophisticated operating systems than ever before.

And the machine likely to be at the top of the list is the IBM Personal Computer (PC). Solid, dependable IBM was the first manufacturer to sell a 16-bit desk top computer offering processing power akin to that of a low-end minicomputer.

But that was in the States – we had to wait until January for the appearance of the PC in this country.

And that 18 months delay was a godsend to other computer manufacturers large and small. It gave them the opportunity to develop their own systems, and get a foot in the door before the IBM arrived.

Surprisingly, the version of the IBM PC released in the UK varied little from the original released in the US back in 1981.

So rival companies have utilised technological advances and produced systems that are in various ways better than the PC.

Perhaps that is an almost sacrilegious statement – there will always be people who will buy IBM no matter what, who are prepared to pay over the odds for the security of buying from the world's largest computer manufacturer.

The point of the list that follows, however, is to demonstrate that you can buy a system that will do everything the IBM PC will do – and sometimes more – for the same or even less money.

The fact remains, however, that IBM has set the industry standard as far as 16-bit micrcomputers go, so it would be as well to consider why this is so before looking at the rest of the field.

Perhaps the first point to consider is the size of IBM's public relations budget – which is probably the equivalent of many smaller manufacturers' annual turnover.

But the ability to shout louder than anyone else doesn't mean the product is any better.

The overriding reason for the PC's popularity is IBM itself. Customers feel that, rightly or wrongly, they are getting the best money can buy.

There's no getting away from the fact that IBM does have an excellent record for customer service and support.

Another reason is the amount of software developed specifically for the IBM PC. Although there are comparatively few 16-bit application packages around so far, many of those that do exist were developed in anticipation of the IBM PC's release in this country.

So IBM has, to some extent, influenced what software is now available. That is why so many other companies are producing 'IBM-lookalike' systems. With the same processor and operating system as the IBM, users can access the huge range of software packages being developed for the IBM PC.

So, many people will tend to play safe with the IBM rather than look at other systems whose suppliers do not have the sort of established background that IBM has.

But many of these systems could be worth serious consideration – after all they have to concentrate on good design, advanced features and lower prices than IBM in order to attract business.

They must in some way out-perform the PC in order to beat it.

So read on.

Released in the US by IBM back in 1981, the IBM PC was the first desk-top micro to offer the sort of processing power previously only available from minicomputer systems.

Its arrival in the UK was eagerly anticipated, to such an extent that much software and a variety of peripherals and add-ons were released here prior to its British launch in January.

The system comes in three separate 'boxes' – the processor box, the screen and the keyboard. The basic configuration has two 160K byte floppy disc drives, although 320K byte disc drives and a Winchester-based system are also available.

Standard memory is 64K bytes, although a 128K bytes version is available. Both green on black and colour monitors are available and can be swivelled but not tilted.

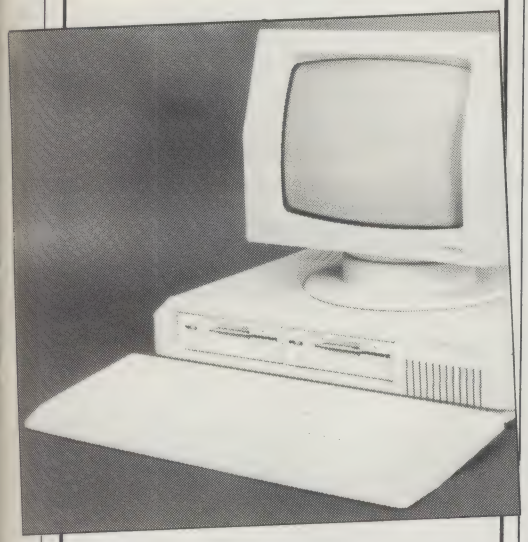
The keyboard, in contrast to the screen and processor box, is slim and stylish with a good touch thanks to its design based on the IBM Selectric typewriter keyboard.

The printer ports and five expansion slots give users access to the host of accessories and add-ons becoming available from peripheral suppliers.

The IBM PC runs the PCDOS operating system which is known on other systems as MSDOS.

As we have already mentioned, a lot of software packages have been developed for the PC, and the recent provision of the CP/M-86 and UCSDp operating systems as optional extras give the user a really wide choice.

A basic system including screen, keyboard, 64K bytes RAM, 320K bytes of disc storage and PCDOS will cost in the region of £2,800.



FUTURE FX20

A recent newcomer to the field, the FX20 offers more memory, faster processing speeds and an attractive, ergonomically designed appearance for £1,000 less than the IBM PC.

The system contains the Intel 8088 processor with CP/M-86 as the standard operating system and MSDOS as an option.

Not a 'lookalike' in the visual sense, the FX20 has been dubbed an 'IBM-thinkalike' by its supplier.

The system is claimed to be twice as fast as the PC and three times as fast as the Sirius.

Visually the system is attractive. It is arranged in the separate boxes – processor, screen amd keyboard – all ergonomically designed.

The 12 inch screen can be fully tilted and swivelled, the keyboard is sculptured – as are the keytops – and the processor box is very slim thanks to Future's use of Hitachi's half-height floppy disc drives.

These drives take standard 5¼ inch floppy discs, their slimness is due to the mechanism being laid horizontal on its side.

They will only take IBM's single-sided discs at the moment though Future is working on adapting the system to handle IBM's latest double-sided discs.

Although the company will not be developing any software itself, an FX20 user will have the choice of software written for both CP/M 86 and MSDOS. He will also have the opportunity to expand the system at a later date by means of the built-in local area network, and network processors which will be released later this year.

SIRIUS

The Sirius was the first 16-bit micro to arrive in the UK back in early 1982. It was developed by Chuck Peddle, who designed the 8-bit chips used in Apple, Atari and Commodore micros.

The Sirius is imported to the UK by ACT under sole distribution deal, and is sold and supported through its nationwide dealer network.

At first, the system was available with the CP/M-86 operating system only, but it now offers the option of MSDOS if required.

The Sirius is cheaper than the IBM PC – it cost approximately £2,400. That will buy you 128K bytes of internal memory, and two single-sided double-density 5¾ inch discs offering a total of 1.2Mbytes of storage.

In other words you get twice IBM's standard memory offering and considerably more storage.

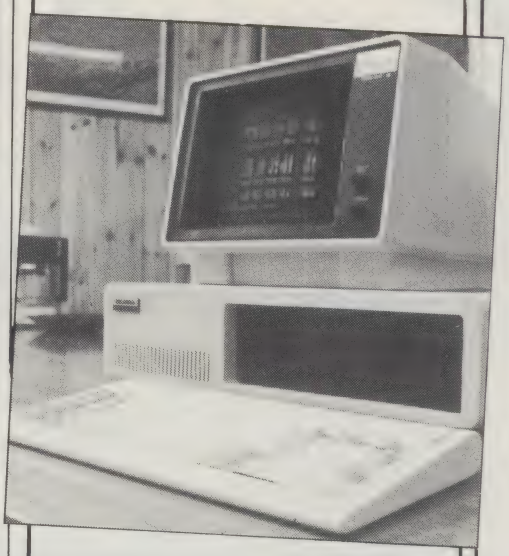
The system follows the three boxes format of the IBM PC – a screen, a processor box and the keyboard, all completely separate.

As for connecting peripherals, the Sirius has two programmable serial ports – one for a printer and the other for communications. There is also a third port offering both Centronics and IEEE-488 connections.

There is room within the processor box for several expansion boards giving extra memory and access to higher capacity disc.

One add-on card of particular interest is the Sirius-89 card which contains a Z-80 processor and 64K bytes of RAM allowing the user access to all the programs written for standard 8-bit CP/M.

This is a useful addition in view of the present lack of 16-bit packages.



COLUMBIA

This machine is an 'IBM lookalike' in every sense of the word, because visually it's very difficult to tell them apart.

The Columbia has a remarkably similar cream colour, screen and keyboard as the PC, the main difference being only that the processor box is slightly longer.

It is a US-built system, imported to the UK by Icarus Computer systems. It features the 8088 processor, and a choice of the MSDOS or CP/M-86 operating system, giving the user a wide choice of software.

The Columbia offers some interesting features for its basic £2,800 price tag. These include 128K bytes of internal memory as standard, 320K bytes of storage on each of the dual single sided double density floppy disc drives, a colour controller card, two RS232 interface ports and a Centronics standard printer connection.

It also offers eight (as opposed to the IBM PC's five) expansion slots which will take both IBM and 'Columbia approved' add-on cards. Extra options include cards to control external 5¼ inch, 8 inch and Winchester disc drives supplying up to some 40MB of storage if required.

So, for about the same price as the IBM, a Columbia user would get twice the memory size and better expansion possibilites, especially by means of the MP/M operating system which it will run.

If colour graphics are required, the user need only buy a colour monitor since a colour control card is included. Incidentally this facility is included on the IBM PC as well though generally the IBM add-ons are on the expensive side.

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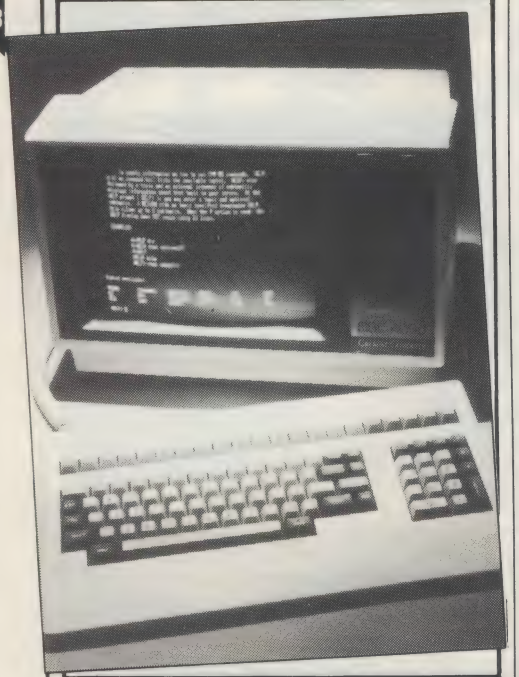

SANYO 4050

Launched directly against the IBM PC, this Japanese machine is available here solely through Logitek's UK network of dealers.

The Sanyo's price of £2,450 includes an Intel 8086 processor with 128K bytes of RAM as standard, dual floppy disc drives giving 1.2Mbytes of storage, a non-glare 12 inch screen and a detachable keyboard.

Unlike the other systems mentioned here, the screen, disc drives and processor are all housed in one box, with only the keyboard as a separate unit.

This isn't as flexible an arrangement as offered by system based on three separate boxes – the screen can't be tilted and swivelled for ease of use and the user needs to accomodate a much bulkier box on whatever the work surface.

However, the processor offered is the Intel 8086, generally acknowledged to be more powerful than the 8088 in the IBM PC. This isn't really noticeable in single-user applications, but really becomes an advantage as you expand to multi-tasking and multi-user applications.

Although the Sanyo runs under the CP/M-86 operating system, Logitek has undertaken to implement MSDOS. giving access to IBM software.

As for existing software availability, the Sanyo runs Peachtree software, a company which has developed a range of applications packages based on the CP/M-86 operating system.

Sanyo will be supplying a colour screen later this year to complement the system's colour graphics capability – no doubt being the result of Sanyo's domestic TV expertise.

Technologically the 4050 is a great advance over the MBC 1000.

ADVANCE

An IBM PC lookalike for under £399 sounds too good to be true but that is just what British company Advance intends to launch next month.

The £399 will buy the system box which looks like a video recorder and contains an Intel 8086 processor, 128K bytes of RAM, BASIC, cassettes operating system and connection for a TV or monitor, cassettes, light pen, joysticks and printer.

It also includes the detachable keyboard which can be slid out of sight behind the smoked glass screen on the front of the processor box.

A further £600 buys an additional box housing slots for up to 512K bytes of RAM and two half-height Shugart 5¼ inch disc drives giving 320K bytes of storage.

So for £399 you will theoretically be able to buy a powerful home computer which needs only be linked up with a TV set and a cassette recorder to operate.

While £399 will buy a business system with the facility to add Winchesters at a later stage if needed.

A monitor and printer, however, are not included and will need to be purchased separately. Nevertheless, this system certainly offers value.

Although the processor is Intel's more powerful 16-bit offering – the 8086 – Advance assures us that the system will run IBM discs.

So this is a system offering a superior processor with twice the standard memory of the IBM PC for around a third of the price.

Perhaps this is the machine that will achieve what IBM set out to do in the US with the PC – become established as a home computer.

DOT

The Dot is an 8088 chip-based micro from US company Computer Devices. However, if you have seen that company's advertising campaign, you won't need reminding of the machine's national origins!

The system is unusual in that a 160 character per second dot matrix printer is incorporated into the processor box, along with the small (5 inch by 9 inch wide) screen and the twin Sony 3½ inch disc drives.

The idea is that the system is small enough to be carried reasonably easily from, say, the office to home and back to the office again in the morning – a carrying case is provided for this purpose.

The size of the disc drives prevent the user from using IBM discs, although the operating system is the same – MSDOS.

However, Computer Devices claims that a variety of packages – eg financial planning, word processing, accounting, graphics etc – are available immediately.

An optional extra on the DOT is a Z80 cpu giving access to 8-bit CP/M software.

The system offers from 32K bytes to 256K bytes of RAM, with a total of 704K bytes possible by means of an add-on memory board.

Facilities to upgrade the system include only two slots in the processor box – which can accomodate IBM-compatible cards.

The screen is available in a choice of monochrome, green or amber displays, and offers high-res graphics.

And the price of all this? Computer Devices quotes a starting price of £2,300 – but expect to pay more for a reasonable amount of RAM.

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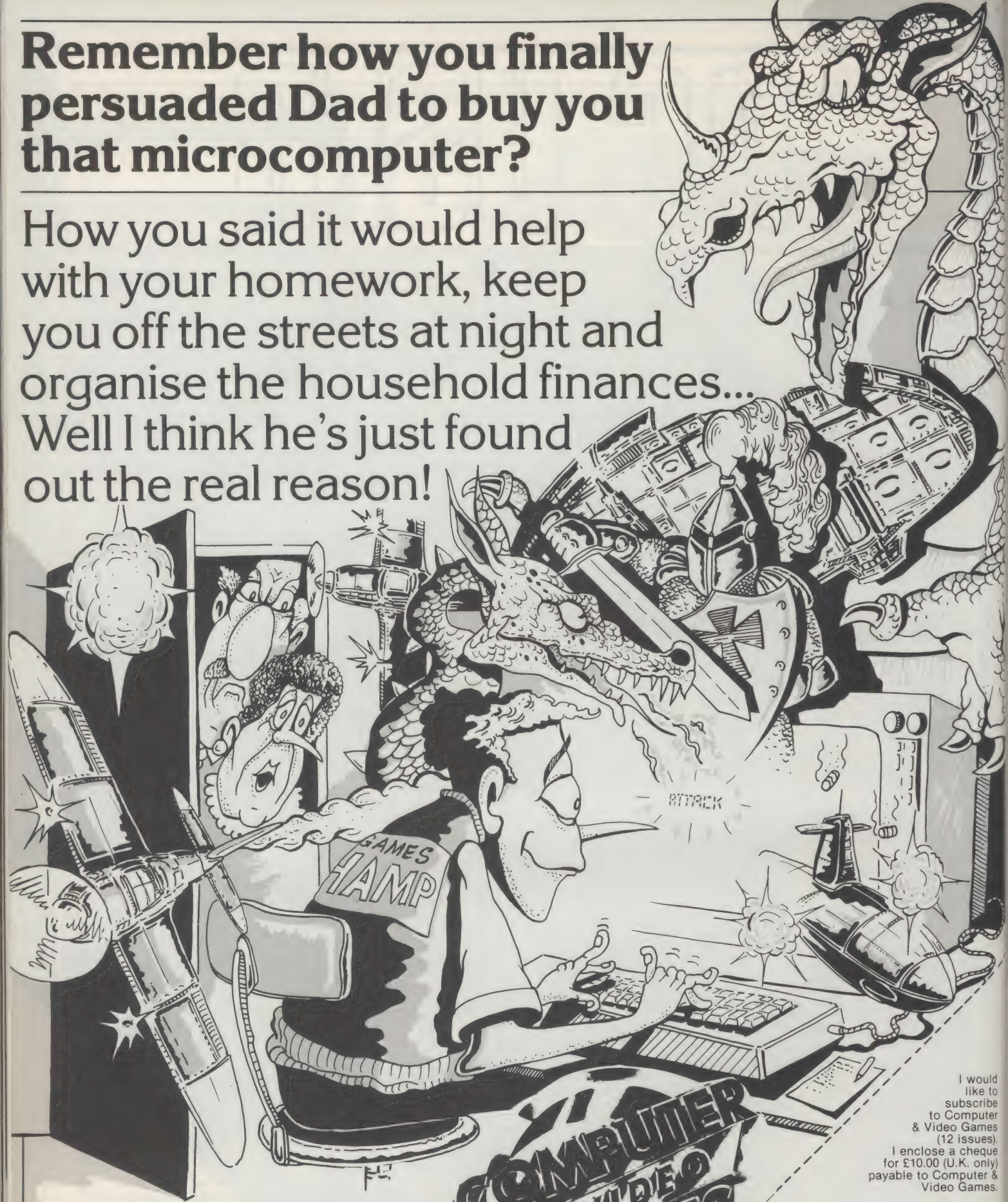

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PRESTEL UNDER ATTACK

The mysterious B.T. Pretzel goes behind the scenes to reveal the side of Prestel most users never see.

Since we began this series of 'Breaking Into Prestel' – we've only looked at the end results.

That's to say, we've only considered what appears up there on the screen when you turn on and tune in to Prestel or whatever you choose to call the British Telecom viewdata which comes down the phone lines.

What you never see is an accompanying 'back-side' to every viewdata frame. When someone composes a frame of information to put into Prestel, they also have to give very specific information to the 'editing' computer at the other end – the one which is accepting (hopefully) the layout and colours which are being typed into the system.

Whenever any viewdata frame is going to be composed, the Information Provider– or Sub-IP, in the case of a small outfit renting a facility from a larger Provider – decides first on a number of options.

They key in the number *910# which takes them to a page which is accessible only to IPs. The viewdata computer checks to see if they're allowed access to this page in a way that I'll describe in a minute or two.

At page 910 they're asked to enter their Editing Password, and if all's valid, they're allowed through into the Prestel Editing System. This is the biggy!

Bit by bit, options appear on the screen, and wait for a correct response to be made via the keyboard.

Closed User Groups

'CUG' – isn't it a peculiar, crude sounding word? It's short for Closed User Group. If, when you're composing a page, you don't specify anything at that stage, but simply leave the option open, the editing system carries on to the next choice: User Access.

If, however, you do specify a number in response to that 'CUG' prompt, then only those people who have been assigned membership of that uniquely-numbered User Group will be able to look at that particular page!

And this, apparently, is what members of some of the computer clubs are doing on an area called 'ClubSpot 800' – which has been given to them by the Micronet people.

The clubs are putting up general information about themselves without any 'CUG' number attached to the pages. And that way, anyone can read the info. However, there was a lot of

discontent known to be bubbling underneath, for although Prestel seems a fine way for club members to interface (ugh!) with each other, what about the material which you want to restrict to those people who have paid a club membership fee?

Let's say an Information Provider is slowly building up an important area of Prestel. It's going to tell you all about home loans and finance; all about mortgages and how to get one on the cheap; it's going to offer 'armchair shopping' – which means that you simply type in your Nottingham (whoops!) er, Barclaycard Visa number and any manner of things from Dralon lounge suites (treble-ugh!) to a pair of ice skates will be sent round to your address.

To stop anyone looking at these Prestel pages till they are ready to be unveiled to the public, the Information Provider types in an 'n' for 'n'' at the compositor's prompt 'User Access'.

But hold on a minute! If you're building a database of a few thousand pages, and you type 'no' user access on every frame, it's going to take ages to over-write those 'n' responses with 'y' come the day that you unveil the marvel to the waiting world.

So what's the short cut?

You've guessed it! You make the first few pages 'no' user access, and leave it at that. Then when the big day comes, you simply change 'no' to 'yes' on half a dozen pages and your creation is revealed in all its glory.

When you try *444# or in the days before March 1st if you tried *600# you'd get a curt line-24 message suggesting perhaps you weren't quite compos mentis.

In other words, you'd been blocked out by whoever was trying to keep those pages a secret. All right – you know they're not going to make every single page 'no' user access. So you try a little deeper into the database: meaning you add on a few digits and then try again.

So you tap out *60000# or *600610# and hey prestel! You're in!

You have a look around, you mosey on a little deeper, down to the nine-digit level, and you've discovered all there is to know, months before the grand unveiling.

No Entry

Now, about checking to see whether anyone is allowed access to the magical page 910: all Information Providers are enrolled into the 'CUG' which bars ordinary peepers from *910#.

As soon as you type that three-digit number, the main Prestel computer checks your identity, and if you don't have that 'CUG' number tacked to your name it's No Entry, pal.

There does seem to be a catch though. It appears – not even Prestel themselves currently seem to be certain about this – that CUGs cannot be nested, in the way that FOR/NEXT loops can be nested inside one another in BASIC.

This implies that you can't be a member of an Information Provider's CUG – designated by the IP – and of a sub-IP's CUG at the same time. The arrangement is that membership of the sub-IP's CUG automatically has you enrolled into the main IP's CUG.

Now, is that a way for a computer club to enrol fee-paying members into their CUGged areas of ClubSpot 800, and thus automatically give those members access to Micronet 800 and all the rest of Prestel without those members having officially joined up. If there's a sudden rush of hundreds – thousands? – of members to join the Amateur Computer Club, then the answer must be 'Yes'!

Finally, the competition. Using all the hints in this 'Breaking In..' episode; what sits on *8008886#, and how did you find it? First prize is a year's free subscription to *Which Micro?* plus free admission – I know it's a long way ahead – to this year's PCW exhibition.

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BUYER'S GUIDE

MAY 1983

Here is this month's updated buyer's guide giving information on microcomputers currently available in the UK for under £5000.

Every effort is made to keep the information accurate and comprehensive but please send any additions or corrections to Buyer's Guide Editor, Which Micro & Software Review, Scriptor Court, 155 Farringdon Road, London EC1R 3AD. In order to keep the listings as free of computer jargon as possible we have wherever possible tried to make the guide straightforward and self-explanatory. But for those using it for the first time a few explanations are given below.

Price – The costs quoted for each micro are based on the most common retail price prevailing at the time of going to press.

But when budgeting for a system remember that the machines will usually require extras to perform their required function. This ranges from access to a television set and cassette recorder with the cheaper machines to spending several hundred additional pounds on a printer if serious business use is being considered.

Use – This gives an idea of what most machines are best suited for – though price tends to be the overriding factor as few non-millionaires would spend £3000 on a computer to play games with. But additionally some micros have large amounts of software and special features that are tailored for a particular market.

RAM – The size of the RAM memory in a computer defines how large and how sophisticated a program can be run. It's generally true that the larger the memory the better the computer – and the more expensive.

Colour – Micros that show colour when plugged into a colour television are becoming increasingly popular in the home market as prices fall. For many business applications, however, colour is not considered that important.

CP/M – This is a widely used operating system for micros and, in the business field particularly, it allows machines which use it the potential to run a large range of software. But it is only potential so check how much is really available.

Some manufacturers – including most of those which produce computers suitable for the home – produce their own unique operating systems that need software to be specifically written for it.

With the popular machines this is unlikely to be a problem but with less well known or new micros it is advisable to check that the type of software you will require is readily available.

Languages – Nearly all micros offer the Basic computer language which, at the moment, is the easiest and simplest language for those wanting to learn how to program. Other languages tend to offer more powerful facilities or are specially suited for particular applications.

Interfaces – These are the sockets on a micro which allow such peripherals as printers and modems to be connected and controlled by the computer. The most common is the RS232C interface and a wide range of equipment can be connected to it. With less well-known interfaces you may have a much more limited choice.

The Microcomputers listed in the main section of the Buyer's Guide are arranged by price in ascending order. To find a particular computer check its price in our alphabetical cross reference section.

Acclaim	£2225-£4450
Acorn Atom	£120-£250
ADSSSystem 42	£3000
Altos Series 5-15D/5-50	£2425
Andromeda 12L	£1299
Andromeda Alpha	£695-£3695
Andromeda Zita P+PW	£995-£2895
Apple II	£812
Apple III	£2418
Atari 400	£400
Atari 800	£399
Basic 108	£1095
BBC A&B	£299-£399
BMC Oki	£3150
Bonsai SM3000	£2750
Caltext 1/1A-3/3A	£1899-£2149
Caltex 4/4A	£4457-£4657
Canon TX10/15	£800
Canon CX-1	£2500
Casio FX 700P	£69.95
Casio FX 702P	£89.95
Casio FX 801P	£350
Casio PB100	£80
Colour Genie	£199
Comart Communicator CP range	£1895-£2495
Comart CP1000	£3395-£4395
Commodore 64	£340
Commodore Series 4000	£550-£695
Commodore 510	£695
Commodore Series 8000	£895-£1195
Commodore 700 Series	£995
Commodore Vic 20	£120
Concept-09	£995
Cortex	£295-£395
Corvus Concept	£4250
Cromenco Personal Computer	£1095-£1795
Cromenco System 1/2	£2295-£2620
Cromenco System 3	£4495
CWP Context	£1495
Data General Enterprise 100	£4750
DEC Rainbow 100	£2359
DEC Professional 325	£2677
DEC Professional 350	£3317
Director System	£1999
Dragon 32	£199
Durango F85	£4995
Eagle II-IV	£2350-£3650
Enterprise 1000	£2300
Epson MX-20	£402-£475
Equinox Series 5000SX	£2950
Equinox Series 8000SX	£4250
Facit Desktop 6510/6520	£2560-£3420
Fox	£2900
Genie I & II	£299
Globe 101	£1900
Hewlett Packard HP75C	£694
Hewlett Packard HP86A	£1251
Hewlett Packard HP85A	£1917
Hewlett Packard 87	£1739
Husky	£2280
IBM Personal Computer	£2950
ICL Model 10-31	£2421-£4321
Iona	£3600
IT 3030	£2700
Kalamazoo K1000	£3750
Kemitron K3000E	£3795
Kontron P5180	£3700
Link 480Z	£550
MS	£2795
Metrotech Dynabyte 5200/5300	£2440-£3350
Metrotech Dynabyte 5505	£4690
Midwitch Controller	£375
Microtan	£79-£90
Micro Professor	£80
Midas Range	£895-£3520
Millbank System 10	£2395-£2895
Mimi 801	£1350
Morrow Designs	£895-£2295
Multicomputer M210	£4250
Nascom 1-2	£125-£265
Nascom 1-2	£125-£265
Nascomb 3	£376-£506
Newbrain A/AD	£233-£267
North Star Advantage	£2195
Olivetti M20	£2395
Oric 1	£100
Orion	£2950
Oscar	£2645
Osborne 1	£1250
Rair Black Box 3/30A	£3750
SWTP	£4000
Sage II-IV	£2995
Sanyo MBC 200/300	£2250-£3500
Saracen	£2200
Seed System 19	£1900-£4895
Sharp PC1251	£80
Sharp PC1500	£170
Sharp MZ80A	£477
Sharp MZ80B	£899
Sharp PC3201	£2750
Signet 202S/211	£1400-£1750
Sinclair ZX81	£49.95
Sinclair Spectrum	£125-£175
Sorcerer	£790
Sord M23 Mkl-Mk V	£1870-£2266
Sord M23P	£1560-£2060
Stratos	£2950
Sundance	£4999
Superbrain 11/W6	£1800-£2415
System M-Three	£1795-£3150
TECS	£1380
Tele Video TS802 Range	£2535-£4349
T199/4A	£150
Torch	£3499
TRS-80 PC-1	£89
TRS-80 PC-2	£179
TRS-80 Colour Computer	£229-£369
TRS-80 Model II	£2699
Transtec BC2	£1975-£2400
Triumph Adler Alphatronic P2	£2935
Tuscan	£309-£1149
Vector V4 20/30	£2995-£3995
Vector Series 801	£3255
Wicat 150	£4995
Xerox 820 & 820-11	£1750
YD8110	£3500-£3900
Zenith Z100/120-22	£1973-£2453

UNDER £500

NAME	PRICE	USE	RAM	COLOUR	CPM	LANGUAGE	INTERFACE	SUPPLIER
Sinclair ZX81	£49.95	Home Education	1K-64K	No	No	Basic	Other	Sinclair Research 0276-685311

COMMENT: The classic "starter" computer now available for less than £50. Considered best for learning rather than doing anything too serious. Cassette tape storage only. Memory can be expanded to 16K with plug in extra memory and even further with the independent suppliers. This additional memory can cost more than the ZX81.
SOFTWARE: Plenty of software available at around £5, but anything useful tends to require the extra RAM pack. Includes limited graphics but it won't look like an arcade game. Wide range of independent companies supplying software packages.

Microtan	£79--£80	Home Technical	1-48K	Extra	No	Basic Forth	RS-232 available	Tangerine 0353-2271

COMMENT: A micro supplied either in kit or ready assembled form intended for home and technical use. The Microtan is based on the 6502 chip and consists of a basic motherboard with the keyboard or numeric keypad extras. You view the image on your own domestic TV. Provision for ultimate up to 328K if required. Programs can be loaded from your own cassette recorder and the system can expand to include disk drives. The Microtan appeals to both the enthusiastic beginner or the dedicated hobbyist who wishes to expand his system from the essential elements to include larger memory capacity and high-resolution graphics.
SOFTWARE: Limited range available.

Casio PB100	££80	Home, Business	None	No	No	Basic	Own	Casio 01-450 9131

COMMENT: Yet another pocket "computer" — one of the fastest growing areas of the micro world — the PB100 has the capacity to handle ten programs totalling up to 544 program steps with 26 independent memories available. If you trade program steps for memory there can be a maximum of 94 memories. Using an optional expansion pack the number of program steps can be extended to 1568 and memories to 222. With a typewriter style keyboard and separate numeric keypad, the PB100 has a 12 position dot matrix display and has facilities for playing games just like larger micros. Powered by 2 lithium batteries the PB100 works up to 360 hours on a single set. A cassette interface and printer will be available soon.
SOFTWARE: The PB100 comes with its own programming guide to Basic.

Sharp PC1251	£80	Home, Business	4.2K	No	No	Basic	Exclusive	Sharp 061-205 2333

COMMENT: A pocket micro computer on the lines of the PC1500 from the same company. 24 character single line liquid crystal display. Up to 300 hours operation from a single set of batteries. Optional cassette recorder — using micro-cassette and combined printer available at around £100.
SOFTWARE: Though the system can be programmed in Basic there is only a very limited range of programs available as yet.

Micro Professor	£80	Education Home	2-4K	No	No	—	Other	Flight Electronics 0703 34003

COMMENT: The Micro Professor is a complete micro computer system but designed chiefly to be a learning tool. It is really only suitable for hobbyists, students and for use by instructors of electronic engineering and computer science. It can be expanded with a speech synthesiser board (£85), a 20 character thermal printer (£72), a sound generator board (£70) and an Eprom Programmer Board (£85).
SOFTWARE: None supplied — as a learning tool the user is expected to write his/her own software.

NAME	PRICE	USE	RAM	COLOUR	CPM	LANGUAGE	INTERFACE	SUPPLIER
TRS-80 PC-1	£89	Home	1.9K	No	No	Basic	Other	Tandy 0922-648181

COMMENT: Genuine pocket computer with integral 24 character display. Separate numeric keypad with 15 arithmetical functions and ten digit numeric accuracy. Limited business use with 1.9K memory. A printer/cassette interface available as an extra produces hard copy 16 characters wide.
SOFTWARE: Range of cassette software with 15 programs ranging from games and business statistics to surveying and aviation. Prices start at £5.95 and go up to £15.95.

Jupiter Ace	£89.95	Home Education	3K-19K	No	No	Forth	Other	Jupiter Cantab 0954-80437

COMMENT: Designed by two people involved with the Sinclair Spectrum, the Ace is unusual in using Forth as its native language. However Forth is ten times faster than Basic and easy to learn. Your own domestic television is used with the Ace, together with your cassette tape recorder. The Ace has chunky graphics and a sound facility. There will be a 16K memory expansion and a parallel printer interface available soon.
SOFTWARE: A catalogue is sent with each machine, but as yet there is only a small choice for Ace users. But with increased popularity of the machine, the independent software companies may produce packages for this model.

Casio FX-700P	£90	Business	None	No	No	Basic	Own	Casio 01-450 9131

COMMENT: Pocket computer on the lines of the Sharp models, with a typewriter style keyboard and 12 position dot matrix display. Handles up to ten programs with a total maximum number of steps of 1568 and 26 memories. The memory steps can be increased to up to 222 at the cost of program steps. Offline programs and data storage available using the cassette tape recorder interface FA3. There will be a printer available soon.
SOFTWARE: The FX-700P is supplied with a program library included in the price.

Oric-1	£100-£169	Home Education	16-48K	Yes	No	Basic	Centronics	Oric Products International 0990-27641

COMMENT: The Oric comes into the hottest part of the micro market competing head on with the Spectrum, at a far lower price. It has an ergonomic keyboard with 57 moving keys, 8 colours, 7 octaves of sound and a hi-fi sound output. Teletext/viewdata compatible graphics. There's an optional modern costing just £50 and coming soon a micro drive and speed printer. Forth language with 48K version.
SOFTWARE: To quote the advertising — software is becoming available for business and other applications but check that the type of software you want is really available and not just "coming soon".

Acorn Atom	£120-£250	Home, Business Education	2-12K	Optional	No	Basic, Lisp Forth	Other	Acorn 0223-245200

COMMENT: Acorn, manufacturers of the BBC machine, supply their own machine in kit or assembled form. You have the choice of cassette or disk drive loading, and viewing with your domestic television set. A special communication module is available to link your Atom to any number of Atoms or even an IBM mainframe computer. So it's a good starting point at a price well below the BBC machine.
SOFTWARE: Acorn have their own range of Acornsoft programs for the Atom micros and currently there are over 50 programs ranging from games, to household and business applications, plus interactive teaching. Though the range of truly business programs is limited only by the machine's memory space. A number of independent software companies are now producing programs for the Atom, so there must be over one hundred packages in total available.

Vic 20	£120	Home Education	5-29K	Yes	No	Basic	RS-232C	Commodore 0753-79292

COMMENT: Apart from the Sinclair ZX81, probably the fastest selling home computer in the UK. A complete departure for Commodore from their chunky Pet days. The Vic 20 has a typewriter style keyboard with special function keys. The colour is excellent and the graphics make it ideal for games. Programs can be loaded from cassette or disk drive, but the drives cost twice as much as the Vic. You also have the choice of plug-in cartridges. Sinclair is going to produce disk drives at £50, so the price of Commodore drives should drop.
SOFTWARE: You have three different systems for your software, cassettes — takes the longest time, but the cheapest; cartridges — most convenient — but expensive and disks if you can afford the drives. There must be over two hundred different games for the Vic ranging in price from £5 upwards. Cartridges cost around £20 each, with disks £2 more than the equvalent cassette. An increasing number of educational programs are being produced for the Vic, but as yet little business software.

Nascom 1-2	£125-£265	Home Education	1-2K	No	No	Basic	RS-232C	Lucas Logic 0926-497733

COMMENT: Two kit form micros that can also be supplied ready assembled, both using IBM style keyboards. The Nascom 1 has 47 keys, while the model 2 increases it to 57 including more controls. Both models produce a 16 line 48 character display on the monitor bought separately. Essentially for the enthusiast. Now the basis of a range of commercial/industrial systems.
SOFTWARE: Using Basic many programs can be adapted and there is a limited range available.

Sinclair Spectrum	£125-£175	Home Education	16-48K	Yes	No	Basic	RS-232 soon	Sinclair Research 0276-685311

COMMENT: On specification the Spectrum is a best seller, with the colour graphics facility, 16-48K memory and Teletext compatibility. Add the sound facility, plus the low cost printer and cheap disk drives and you have potentially the strongest contender in the under £200 market. However it has suffered from long delivery times just like the BBC machine, but not as long. Once the £50 disk drives and networking facilities become available and the delivery problems are solved, the Spectrum will have few competitors. But one could well be the Oric.
SOFTWARE: Initially there is a small amount of software available for the Spectrum, mainly in the games field, but this is increasing fast. There should also be some business programs available in the near future.

Casio FX702P	£135	Business	None	No	No	Basic	Own	Casio 01-450 9131

COMMENT: A pocket micro computer which is really a more sophisticated version of the FX-700P. Programming capacity between 1680 steps with 26 memories or 80 steps with 226 memories. Variable between these two figures. Typewriter style keyboard and 55 single key routines including log, trig and hyperbolic functions. Built-in statistical routines including standard deviation, regression anaalysis and correlation coefficient. Liquid crystal display showing up to ten digits plus two in the exponent. Powered by lithium batteries providing power for up to 240 hours operation. programs and memory are retained when the Casio FX-702 is turned off. Other elements in the Casio system include a cassette interface and the FP10 printer. There will also be interchangeable RAM packs to extend the memory capacity.
SOFTWARE: Supplied complete with a program library comprising 73 computation examples covering nine fields. You just type them in.

Texas Instruments TI99/4A	£150	Home Education	16-48K	Yes	No	Basic Pascal TI Logo	Other	Texas Instruments 0234 67466

COMMENT: Uses a 16-bit chip and has three ways of loading programs. Cassette, floppy disks and plug-in cartridges. Used with your domestic televsion the TI99/4 hasn't reached the popularity expected and the price has been reduced from £399. And voucher system makes price effectively £150.
SOFTWARE: Mainly available on cassette and cartridge, there is less independent software for this micro than others in this price range.

NAME	PRICE	USE	RAM	COLOUR	CPM	LANGUAGE	INTERFACE	SUPPLIER
Sharp PC1500	£169.95	Home, Education Business	3.5-11.5K	No	No	Basic	RS-232 available	Sharp 061-205-2333

COMMENT: A true pocket micro computer with single line display replacing the conventional monitor. Large typewriter style keyboard with separate numeric keypad. Add-on memory chips increase total RAM to 11.5K, while CMOS circuitry retains data even when the PC1500 is switched off. Accessory printer/cassette interface produces a printing facility in four colours using ballpoint pens.
SOFTWARE: Limited range available in cassette form for the PC1500. Mainly from independent companies like: Kuma Computers of Maidenhead, Microl of Cambridge, Elkan Electronics and Micros of Managers — London.

TRS-80 PC-2	£179	Home Business	3.5-11.5K	No	No	Basic	Other	Tandy 0922-648181

COMMENT: This pocket computer looks very similar to the Sharp PC1500, the main difference being the name at the left hand end of the micro. Sharing the features of the Sharp PC1500, the PC-2 also has the printer/plotter/cassette interface for printing out results in four different colours.
SOFTWARE: Limited range of software available in cassette form for the PC-2, mainly from independent companies like Kuma Computers, Microl of Cambridge, Elkan Electronics and Micros for Managers.

Atari 400	£199	Home Education	16-32K	Yes	No	Basic	RS-232	Atari 01-900-0511

COMMENT: Advertised extensively on television, the Atari has extremely effective graphics where you can choose from 128 colour combinations and 18 screen arrangements. There are four sound channels with a range of three octaves. The Atari 400 has a touch sensitive keyboard and loads from cassette recorder or disk drive. Programs in cartridge form can also be slotted into the micro. In the under £200 market the 400 faces strong competition from the Dragon and the Colour Genie apart from the Spectrum.
SOFTWARE: Several hundred different programs are available for the 400, including utility and educational programs. One dealer is even offering 100 free programs with each Atari 400 and that's a real bargain.

Colour Genie EG2000	£199	Home Education	16-32K	Yes	No	Baic	RS-232	Lowe Electronics 0629-4995

COMMENT: Another contender in the under £200 market with 128 programmable graphic characters and three sound channels, plus music synthesiser. Full size typewriter keyboard, cassette loading, view on your domestic television set.
SOFTWARE: Genie computers are very similar to the TRS-80 range and there is a degree of interchangeability with software. As more programs are available for the TRS-80 range, even than the Apple, there should be no shortage of programs for the Colour Genie.

Dragon 32	£199	Home Education	32-64K	Yes	No	Basic	RS-232	Dragon Data 0792-580651

COMMENT: A new contender in the under £200 market, with 32K RAM, nine different colours and a range of nine octaves of sound. Standard typewriter keyboard with space bar. Eight graphics pages for five different resolutions and scale from 1/4 to 15 times magnification. The Dragon uses the 6809 chip, more powerful than the 6502 fitted to the Pet, Apple, Atari and similar machines. Programs are loaded by cassette from your own recorder and viewed on the domestic television set. Disk drive units will be available soon.
SOFTWARE: Currently you have a very limited choice of cartridges or cassettes. Cartridges are expensive but load faster.

Lynx	£225	Business Education	48-192K	Yes	Com-patible	Most	RS-232C	Camputers Ltd., 0223 315063

COMMENT: Claimed to have an extremely simple Enhanced Basic and easy to understand manual plus a typewriter style keyboard. Unlike most low priced micros that use a lot of memory for the colour display, the Lynx produces true hi-res graphics. Currently uses a cassette interface, but disk drives, monitors and printers should be available soon. Provision for expandability to 192K, puts the Lynx streets ahead of many of the £200 competitive machines.
SOFTWARE: CPM compatibility puts the Lynx ahead of many of its competitors as far as business and professional use is concerned. So you could use Wordstar with a £200 micro. However Camputers are working on their own range of software.

Micro-Professor MPF-11	£230	Home, Business Education	64K	Yes	No	Basic	RS-232	Flight Electronics 0703-34003/27721

COMMENT: The Micro Professor's claim to fame is quite simple, it's compatible with Apple software. Currently you can only load from cassettes, but disk drives and low cost printers will be available "soon". Unlike the Apple, the MPF-11 is not expandable but in its normal configuration it has 16K more RAM than a normal Apple. Provision for software to be plugged into the MPF-11, when its supplied in cartridge form. It takes a few short cuts and the keyboard is less well designed but if you want an Apple and can't afford it, consider the MPF-11.
SOFTWARE: Compatibility with Apple software gives you an almost unlimited range to choose from.

Newbrain A/AD	£233-£267	Business Education	32-upwards	No	Yes	Basic	RS-232	Grundy Business Systems 01-977 1171

COMMENT: Almost pocket sized micro with full size keyboard. You have the choice of loading programs from an extra tape recorder or disk drive depending on the application. Two versions, with the AD having a calculator type 16 character blue-green display. Optional battery back-up module and videotext module for communications with Prestel and all types of viewdata.
SOFTWARE: Initially little available, covers a graphs pack, simple graphics and a text processing package. However, the CPM option lets you have access to plenty of programs including Wordstar.

Cortex	£295-£395	Home Education	64K	Yes	Other	Basic	RS-232	Powertran 0264-64455

COMMENT: 16 bit colour computer available either in kit or ready assembled form. High resolution graphics with user definable characters. Memory mapped video controller. Up to 16 serial I/O ports. Provision for using twin 5¼" disk drives extra.
SOFTWARE: Using a form of Basic the only current option is to write your own programs.

BBC A & B	£299-£399	Home Education	16K upwards	Yes	Extra	Basic, Forth Pascal, Lisp	RS-232	BBC Microcomputer Systems P.O. Box 7, London W3 6XJ

COMMENT: Developed from the Atom, by Acorn, the BBC machine has a full keyboard with ten user definable keys. Programs can be loaded either from a cassette recorder or a disk drive. Extensive graphics facilities and tone generator. Extremely versatile through built-in connections for taking telesoftware direct from Prestel and Teletext services. The BBC uses the Econet networking system using ordinary telephone cable. The model B machine has more sophisticated graphics facilities and an RS-232 compatible interface. This specification makes an attractive package and to avoid the months and months delay buy your BBC machine direct from one of the handful of dealers stocking it.
SOFTWARE: Acornsoft have their own range of programs for the BBC machine and an increasing number of independent suppliers have a range of packages. Acornsoft themselves have: Business games, Tree of Knowledge, Algebraic Manipulation and Peeki Computer. For business use: word processor, desk diary, games are available in the usual range from Invaders to Flight Deck and the solution of the Rubik Cube to name just three. Special plug-in ROM cartridges are also available and can be used with a special extra interface socket.

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NAME	PRICE	USE	RAM	COLOUR	CPM	LANGUAGE	INTERFACE	SUPPLIER
Genie 1 & 11	£299	Home, Business Education	16-48K	No	No	Basic	RS-232	Lowe Electronics 0629-4995

COMMENT: Two similar micros both using the range of TRS-80 Model 11 software. The Genie 1 has its own built-in tape recorder and a full keyboard with space bar. There's a programmable sound unit and the keyboard gives upper and lower case leter. The Genie 11 has a more advanced keyboard with 71 keys that has a full typewriter style section and four special function keys. A disk drive is available.
SOFTWARE: Apart from the wide range of programs available for the TRS-80 Model 11 Molimerx also have a wide range of TRS-80 software in fact there are probably more programs available for the TRS-80/Genie range than any other machine.

TRS-80 Colour Computer	£299-£369	Home Education	16-32K	Yes	No	Basic	RS-232	Tandy 0922 648181

COMMENT: Lowest priced of the TRS-80 range with 16K memory producing eight different colours. Instant loading program packs or choice of loading from cassettes or disk drives. Upgrade kit £69.95 for extra Basic ROM and hi-res graphics.
SOFTWARE: Wide range of programs covering games and education available from Tandy and Molimerx Ltd.

Tuscan	£309-£1149	Home, Business Education	8-24K	No	Yes	Basic, Pascal Cobol, Lisp	RS-232	Microsystems 01-405 5240

COMMENT: Starter kit available at £309 intended for first time users and schools and skill centres. Expandable to full CPM, for the person who likes building computers. The home computer is ready assembled with printer and cassette interface expansion slots and has a professional keyboard as optional extra, price £499.
SOFTWARE: Use of CPM plus the range of programs in the Microsystems catalogue.

Commodore 64	£340	Home, Business Education	64K	Yes	Extra	Most	RS-232 IEEE 488	Commodore 0753-79292

COMMENT: Far more powerful version of the Vic 20 with a massive 64K for £130 more than the Vic. Hi-res graphics with bit mapped screen. The dedicated video chip let you use hi-res Sprites — movable object blocks — which can give full three dimensional effects. Three independent voices available with the sound chip giving a range of nine octaves. Wide range of interface adaptors lets the Commodore 64 communicate via networking, printers, plotters and Prestel. Typewriter style keyboard with special function keys. Program loading either from cassette recorder or disk drives, both extra. View the image on your domestic television set.
SOFTWARE: While a special range of business software is being produced, existing Vic and 40 column Pet programs can be easily converted. A machine port accepts plug-in ROM cartridges for business, home and educational applications plus CPM packages.

Casio FX-801P	£350	Business	—	No	No	Basic	Own	Casio 01-450 9131

COMMENT: Measuring around 10 x 8 x just under 2", the Casio FX801P is an all-in-one micro which could be compared to the Epson MX-20. It's portable, weighs just 2.3lb, has a built-in micro-cassette recorder and a 20 digit dot matrix all in a single unit. Powered by 6 AA batteries which provide power for around 250 hours, optional mains use. From 80 to 1680 steps and 26 to a maximum of 226 memories. Maximum of 10 groups for the built-in programs. Ten digit single line LCD display.
SOFTWARE: As an optional extra there's a program library with 73 examples covering 9 fields, but you have to type them in yourself.

MC Microcontroller	£375	Education	16K	No	No	Basic	RS-232C	Datec 061-941 2361

COMMENT: Aimed at the education market and a potential competitor for the Research Machines 380Z, the Midwitch MC is a control computer for schools and universities. Intended for cassette loading of programs it uses a version of Basic which is quite close to Microsoft Basic.
SOFTWARE: As this micro uses Basic of a slightly different type, it should be simple to adapt programs that can be run with it. In the education market, most of the users will most likely be producing their own programs rather than relying on commercially produced products.

Nascom 3	£376-£506	Home Education	8-48K	No	Yes	Basic Pascal	RS-232	Lucas Logic 0926-497733

COMMENT: Single piece micro with typewriter style keyboard complete with cassette interface. Disk drives available as optional extras. Graphics facilities and potting commands in Basic. 16 parallel input/output lines available. Video controller for 40 or 80 column display.
SOFTWARE: CPM programs plus NAS-Pen — Nascom's own word processor plus specialised debugging aids and editor assemblers.

Atari 800	£379	Home, Business Education	16-48K	Yes	No	Basic	RS-232	Atari 01-900 0511

COMMENT: The Atari 800 is the top model of their range and features a typewriter style keyboard and memory expansion to 48K. It retains the excellent graphics facilities of the model 400. Loading of programs from cassettes or cartridges or a disk drive.
SOFTWARE: Apart from the hundreds of software packages for the Atari range, there has been a new trend to produce business programs for the model 800. There is the Chipsoft range from Silicon Chip of Slough who offer: Stock control, sales ledger, purchase ledger, mail shot and PAYE for around £150 each.

Epson HX-20	£411	Business	16-32K	No	No	Basic	RS-232	Epson UK 01-900 0466

COMMENT: A portable micro computer which includes a liquid crystal display that shows 20 characters on a line, and a printer. The keyboard is standard typewriter style plus eight special function keys. With its built-in ni-cad cells the Epson can operate for up to 50 hours and can be recharged in eight hours. There is provision for a micro cassette drive as optional extra, to fit on the right of the screen. Price £75 plus VAT.
SOFTWARE: Will be provided in microcassette form and about 12 applications are claimed to be available at launch time.

Yoric	£450	Business, Home Education	48K	Extra	Extra	Basic (in ROM)	Other	Kram Electronics 0533 27556

COMMENT: This is an Apple lookalike made in the Far East, which claims to be compatible with their disk drives and software. No software is supplied. For an outfit with monitor and disk drive the prices goes up to £850. For the potential Apple purchaser at a slightly lower price, but without their extensive back-up.
SOFTWARE: Being compatible with the Apple there is probably more software available for this micro than any other, apart from the TRS-80. Whether you want games, education or business programs. If you add the Z80 softcard CPM programs can be used.

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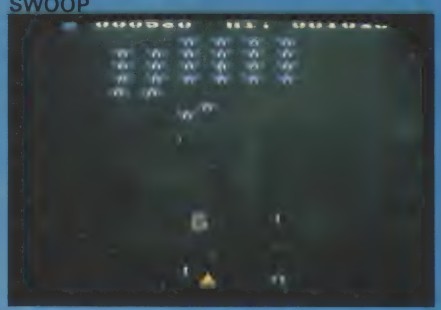

LASER COMMAND

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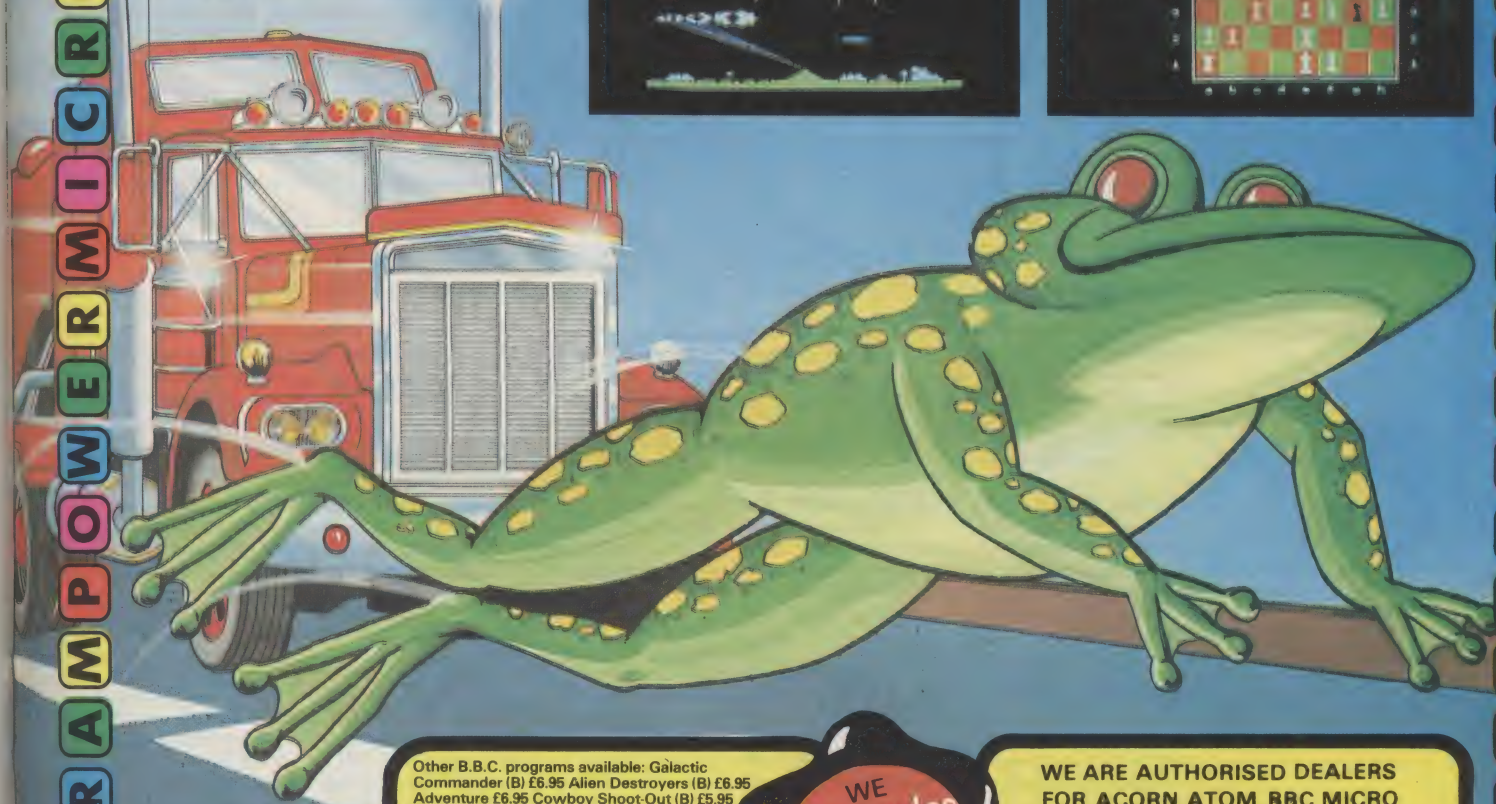

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NAME	PRICE	USE	RAM	COLOUR	CPM	LANGUAGE	INTERFACE	SUPPLIER
Irvine IBS 750	£475	Business	64K	No	Yes	Most	IEEE 488	Irvine Business Systems 0294-75000

COMMENT: Single board computer using Z80 processor with basics for use with separate keyboard and monitor. CTC, real time clock with battery back-up. Monitor in PROM. 80x24 lines video generator. 2 serial ports and 4 parallel ports. Floppy disk controller. 5¼" floppy disk double sided, double density 400K, £195 each.
SOFTWARE: Use of CPM as the operating system assures a wide range of packages for most requirements.

Sharp MZ80A	£477	Home, Business Education	48K	No	Extra	Basic Pascal	Other	Sharp 061-205 2333

COMMENT: Single unit micro incorporating 9" green screen monitor, cassette recorder and standard typewriter keyboard with numeric keypad. Optional disk drives for faster loading of data.
SOFTWARE: Limited range of software available, but ample for the home user. Small range of business and education programs. Adding the CPM option opens the door for specialist programs including Wordstar.

£500-£999

NAME	PRICE	USE	RAM	COLOUR	CPM	LANGUAGE	INTERFACE	SUPPLIER
Commodore Series 400	£550-£695	Home, Education Business	16-32K	No	No	Most	IEEE 488	Commodore 0753-79292

COMMENT: Updated version of the first micro available in the UK, the Commodore Pet. The Series 4000 is a one piece micro with integral monitor with separate disk drives available as extras. You could use cassette loading. Now looking long in the tooth against the competition.
SOFTWARE: The Commodore applications brochure lists hundreds of specialised programs from word processing to most of the applications needed in modern business. A large number of games and educational programs are also available.

DAI Personal Computer	£595	Home, Business Education	48K	Yes	Com-patible	Most	RS-232	Data Applications UK 0285-61828

COMMENT: Micro with 16 colour hi-res graphics offering program loading either from cassette or disk drives extra. Sound commands for music generation. The 24K ROM based software includes a fast Basic interpreter, scrolling screen editor, machine code utility program, twin cassette file handling and disk support.
SOFTWARE: CPM compatibility plus a range of Dainasoft programs covering games, education, word processing and viewdata — Prestel.

Link 480Z	£550	Education Business	32-256K	Yes	No	Basic, TXED Forth, Assem	IEEE 488	Research machines 0865-49866

COMMENT: Micro specifically designed to be used in a networking system at far lower cost than competitive systems. Basically a simplified 380Z with cassette program loading and choice of 40 or 80 characters on your domestic TV screen or monitor. Full graphics facilities of the Research Machines 380Z, with memory not eaten up by the use of graphics.
SOFTWARE: Compatible with the wide range of programs available for the 380Z.

Orange	£595	Business Education Home	48K	Yes	Extra	Most	RS-232	Collins International UK Ltd., 8 Staple Inn, London WC1V 7QH

COMMENT: Another Apple II lookalike which offers more features at a lower price. Apart from being compatible with hardware and software, this machine has a keyboard with upper/lowercase capability and a separate numeric keypad. 8 slots for expansion just like the Apple original.
SOFTWARE: Literally all the programs available for the Apple II/IIE should fit, plus CPM using a Z80 softcard.

NEC PC-8001	£599	Business, Home Education	32-64K	Yes	Extra	N Basic	RS-232	NEC 01-388 6100

COMMENT: The NEC PC-8001 looks like lots of other micros on the surface. However it has a Z-80 chip for the central processing unit and two more chips for the RAM and masked ROM. Making a more advanced specification with the chips than some other micros. The keyboard is typewriter style and there is a numeric keypad plus five special function keys. You have the choice of adding programs by cassette or disk drive. Green screen monitors and colour models are available. Complete systems comprising the PC-8001, printer, dual disk drive and green monitor start around £1,825. For the 64K system which includes a daisy wheel printer for word processing the cost is around £3,300.

Hewlett Packard HP75C	£694	Business	16-120K	No	No	Basic	RS-232C HP-IL	Hewlett Packard 03446-3100

COMMENT: Pocket computer with potential for using Visicalc and producing graphics presentations. Battery powered, the memory is retained even when the computer is switched off, making it ahead of larger micros. Plug-in memory modules can increase the ROM memory to 120K. Built-in 32 character liquid crystal display acts as movable window on a 96 character line. Magnetic card reader gives off-line storage capacity apart from the cassettes normally used to load programs into this pocket micro. Real time clock and non-volatile memory so the HP75 can remind the user of future appointments and run programs unattended. The HP75C comes complete with an HP interface for communications with a range of peripherals and other computers.
SOFTWARE: Two different types. There will be plug-in ROM modules designed to answer specific problems covering finance, real estate, surveying, data analysis and electrical engineering. These will become available during 1983, while there will also be software ROM based, for graphics presentations in full colour, plus personal time management, data communications, memo writing and Visicalc file management. Tape cassettes will aos be available from the HP users library to be used with the HP82161 Digital Cassette Drive.

Andromeda Alpha	£695-£3695	Business	64K	No	Yes	Most	RS-232	IT Computer Services 0784 63211/2/3

COMMENT: The selling methods used for the Andromeda Alpha are the unusual — you buy the software and the hardware comes "free" like the Andromeda Zita range. You have a choice of well known software packages likes MARS and Micromodeller, just two of the packages available. The Alpha is a three part system with separate monitor, twin disk drive and typewriter style keyboard. There is a choice of disk capacity from the single 125K 5¼" floppy disk to win 12MByte Winchester hard disks at the top end of the scale.
SOFTWARE: Buying the programs and getting the hardware free makes the Alpha look like a potential bargain regardless of how many programs you purchase. And with a choice of the most well known ones under CP/M it could well be an attractive package overall.

NAME	PRICE	USE	RAM	COLOUR	CPM	LANGUAGE	INTERFACE	SUPPLIER
Commodore 510	£695	Home, Business Education	64-256K	Yes	Extra	Most	RS-232C IEEE 488	Commodore 0753-79292

COMMENT: Combines the features of the Commodore 720 and 64 in a single package. Full QWERTY keyboard with programmable special function keys and separate numeric keypad. Display on your domestic TV set 40 characters by 25 lines. High resolution graphics 320 x 25 pixels and 16 colours available simultaneously. Provision for loading programs from cassettes or disk drives. SID – Sound Interface Device controls the sound and provides three vhoices each with a nine octave range. The 6567 chip lets you create three dimensional graphics.
SOFTWARE: Currently no software produced, however it's likely that many existing Commodore programs will be compatible with the 510.

Apple 11 Plus Europlus	£699	Home, Business Education	48K	Extra	Extra	Most	RS-232 other	Apple UK 0442-60244

COMMENT: One of the first major products in the micro boom, the others being Pet and TRS-80, the Apple 11 Plus is still going strong, basically because it can be all things to all people. With eight slots in the back, you can start with a disk drive and printer and develop to using an 80 column card, colour and CPM with a Z80 card. You can even increase the memory to over 256K by the use of independent cards that slot into the back of the machine. Apple were the first to have extensive colour graphics facilities hence their popularity for games. The basic Apple has a fairly standard keyboard, without a numeric keypad and programs can be loaded from cassette recorders or the disk drives. Independent companies provide 8" disk drives and Winchester hard disks. Depending on your choice of separate monitor or domestic television set, you can have a biack and white image or colour, just by adding the appropriate card in the back of the Apple.
SOFTWARE: Apart from the TRS-80, there is more software available for the Apple than any other micro on the market. Plus hundreds from the independent companies including Visicalc responsible for selling more Apples to businessmen than any other software package. There is a very wide choice of specialised programs for most types of small business. Add the Z80 card and you have access to CPM.

Sorcerer	£790	Business Education Home	48K	No	Extra	Most	RS-232	EMG Micro 01-688 0088

COMMENT: Desktop micro that has typewriter style keyboard with separate 16 key numeric keypad. Provision for cassette program loading or floppy disks or even a hard Winchester disk, depending on the application. Special video/disk unit incorporating 12" green screen monitor and twin 5¼" floppy disk drives and CPM operating system available as optional extra.
SOFTWARE: EMG have programs available covering business and education. Their current list has around 20 different business packages and 50 educational programs. Using CPM you have range of packages available.

Prophet 2	£795	Business	32K	No	No	Basic	RS-232	Busicomputers 0832-72052

COMMENT: Dedicated micro computer with financial modelling system actually supplied on a chip. This saves the time in loading and lets you make better use of your RAM. The Prophet 2 comes complete with a monitor, keyboard and your model is stored in a cassette player.
SOFTWARE: As the software is supplied on a chip the situation is different from other micro computers. However a range of standard applications is planned with an average cost of around £30.

Apple IIE	£845	Business Home Education	64-128K	Yes	Extra	Most	RS-232 choice	Apple UK 0442-60244

COMMENT: Replacement for the best selling II Plus which sold three quarters of a million worldwide. Instead of the normal 48K RAM fitted to the II Plus, the IIE has 64K as a standard expandable to 128K. The keyboard is typewriter style with 63 keys, upper and lowercase facility. Auto repeat on all keys. 4 cursor control keys and 2 programmable keys. Far less internal components for greater claimed reliability. Apple brand 80 column card and dual 80 column/64K card.
SOFTWARE: Claimed to be compatible with virtually all Apple II Plus programs plus new programs being launched to take advantage of the new IIE features. Certainly there's probably more programs available for this micro than any other.

Midas range	£895-£3520	Business	64K	Extra	Yes	Basic, Cobol Fortran	IEEE 488	Sirton 01-640 6931

COMMENT: Range of micros from the Midas I at £895 right through to the Midas 8-16 with both the Z80 and 8086 processors. Choice from 5¼" floppy disk drives to twin 8" drives and Winchester hard disks.

Fujitsu Micro 8	£895	Business, Home Education	64K	Yes	Yes	Most	RS-232	Minichip Ltd. 09322-42777

COMMENT: Using three separate processors, the Micro 8 has twin 6809s for handling the eight colour high resolution graphics and the third chip, the Z80, lets you use the wide range of CPM programs. The screen format is software controlled between 40 and 80 columns. There are 10 programmable function keys. You have a choice of using either 5¼ or 8" disk drives and there is provision for bubble memory.

Commodore Series 8000	£895-£1195	Business Education	32-96K	No	Extra	Most	IEEE 488	Commodore 0753-79292

COMMENT: Commodore had the first micro in this country, known as the Pet. This is their updated version with typewriter style keyboard, built-in monitor, with disk drives separate from the basic unit. Unlike the smaller models the 8000 series gives you a full 80 columns for word processing. Design and specification wise it's now being overtaken by the newcomers who offer more advanced specifications for similar prices.
SOFTWARE: Commodore have built up a wide range of programs for the 8000 series, from information management, through word processing to management planning and finance. Further programs cover costing, retail, planned maintenance, construction and engineering. A 42 page brochure called "Using your computer" details the comprehensive range of software for the Commodore range.

Morrow Designs Micro Decision	£895-£2295	Business	64K	No	Yes	Basic	RS-232C	Interam 01-675 5325

COMMENT: Using the CPM operating system, the Morrow Designs Micro Decision provides proven technologh at an attractive price for the business user. In its basic form with a single disk drive, the Morrow costs under £1000 and can be built-up by adding a suitable VDU and printer to a complete accounting system for under £2500. Up to 4 disk drives can be used with the controller and the disk format is compatible with Osborne, Xerox and the IBM PC.
SOFTWARE: The Micro Decision is supplied complete with Wordstar, Correct-It and Logicalc – a spreadsheet. Plus CPM, Basic 80, Bazic – North Star compatible, Pilot and Micro Menus. The system including the printer at £2295 comes complete with the Exact Accounting system. Plus the wide range of CPM programs, over 2000 available as extras.

NAME	PRICE	USE	RAM	COLOUR	CPM	LANGUAGE	INTERFACE	SUPPLIER
Sharp MZ80B	£899	Home Education Business	64K	No	Extra	Basic Assembler Pascal	RS-232C	Sharp 061-205 2333

COMMENT: Desktop micro with built-in 9" green screen monitor and cassette drive. Standard keyboard with separate numeric keypad and ten special function keys. Optional graphics facilities and disk drive units for when you find the tape system takes too long.
SOFTWARE: Currently 15 business programs are available and the number is increasing all the time. By adding the CPM facility, you have a range of programs covering most business applications.

Andromeda Zita P & PW	£995-£2895	Business	64K	No	Yes	Most	RS-232	IT Computer Services 0784 63211/2/3

COMMENT: Range of portable micros competitors to the Osborne but instead of "free" software as with the Osborne if you buy the Zita software to a value from £995-£2895, depending on the packages, the hardware comes free. There is a choice of well known business packages like MARS, Micromodeller and full business programs. The hardware in the Zita P range starts with a single disk drive of 125K and goes up to 3 disks of 1MByte each at the top of the range at £2095. The Zita PW incorporates either a 6 or 12MByte Winchester hard disk making it the first Osborne type portable to offer such a large amount of storage capacity built-in. Both models have 10" monitors and typewriter style keyboards with numeric keypads and special function keys. Like the Osborne the keyboard forms the lid of the micro computer when its not being used, and provides a weatherproof seal. As an alternative both machines can be obtained under a loan plan run by the manufacturers.
SOFTWARE: Buying the programs and getting the hardware free looks like making the Zita range a very attractive proposition. It claims to offer Osborne features and more with a larger screen and greater disk capacity — even hard disks, and the CPM option for a large range of programs.

Commodore 700 series	From £995	Home, Business Education	128-256K	No	Extra	Basic	RS-232C IEEE 488	Commodore 0753-79292

COMMENT: Desktop micro with adjustable monitor, typewriter style keyboard and twin 5¼" floppy disk drives, in a single unit. Second processor capability (Z80, 8088, 6809). Adjustable monitor produces an 80 column by 25 line display. Four models in the 700 range from £995 to the top of the range at £1995. All models have 80 column display monitor.
SOFTWARE: Though no software has been currently announced, it's likely that the 700 series will be compatible with the wide range of existing Commodore programs.

Concept-09	£995	Business	56K	No	No	Basic Pascal, Forth	RS-232 Centronics	Micro Concepts 0242-510525

COMMENT: A new British micro computer system using the 6809 micro processor with built-in twin 5¼" disk drives. Requires a monitor and keyboard for use as a system.
SOFTWARE: Using the Flex operating system, the Concept already has a word processor, electronic worksheet, record management system, a cross assembly, micro assembler and two compilers available.

£1,000-£1,999

NAME	PRICE	USE	RAM	COLOUR	CPM	LANGUAGE	INTERFACE	SUPPLIER
Basis 108	£1095	Business, Home Education	64-128K	Yes	Yes	Extra	RS-232C	Community Computers 07308 7567

COMMENT: The Basis claim to fame comes from its Apple 11, compatibility, while offering a more advanced specification. Unlike the Apple, the Basis has both the 6502 and Z80 processors, so the whole range of CPM software is available without any extra cards for the operation. Apple drives can be used with the Basis and there is provision for mounting two drives above the computer unit. Colour is available as standard and the Basis produces an image 80 characters wide on your monitor. The keyboard is connected to the computer by a ribbon cable and has standard typewriter layout with numeric keypad and programmable function keys.
SOFTWARE: Any of the Apple software for the Model 11 Plus can be used, plus the Z80 facility opening the door to CPM programs.

Cromenco Personal Computer	£1095-£1795	Business Education	64K	No	Yes	Basic, Cobol Fortran	RS-232	Comart 0480 215005

COMMENT: Three piece system including software and optional printer. The single 5¼" floppy disk drive has a capacity of 390K. At £1795, this outift also includes a 120 characters per second daisy wheel printer.
SOFTWARE: Supplied complete with a word processing package and a financial spreadsheet, so it's ready to use. Plus CPM.

Sanyo MBC1000	£1195	Business	64K	No	Yes	Most	RS-232	Sanyo Watford 46363

COMMENT: Three piece system with typewriter style keyboard and numeric keypad, that is detachable from the computer and monitor. Double, sided, double density disk drive. Five programmable function keys.

Osborne 1	£1250	Business	64K	No	Yes	Most	RS-232C IEEE 488	Osborne 0908 615274

COMMENT: First of the truly portable micros that comes with its own built-in case to produce a weatherproof package. The keyboard folds down on the computer to form a lid with the total package weighing 24lb. Standard typewriter style keyboard with separate numeric keypad. Built-in twin 5¼" floppy disk drives producing up to 60 pages of typed text on each disk. Small monitor measuring 5" across fitted in between the two disk drives providing a 52 character window on a 128 character line. Optional extras include modern, battery pack. Double density disk drive version available at £1375.
SOFTWARE: The Osborne comes complete with CPM as its operating system, plus Wordstar including Mail Merge, Supercalc, M & C Basic. £800 worth of software in a micro costing £1250 complete. Plus the possibilities of using CPM, the most popular operating system in the world for any extra software you need.

Hewlett Packard HP86A	£1251	Business	54-500K	No	Yes	Most	RS-232	Hewlett Packard 03446-3100

COMMENT: Desktop micro using separate disk drives for program loading and a separate monitor. Typewriter style keyboard with separate numeric keypad and 14 user definable function keys.
SOFTWARE: The HP86A uses the Hewlett Packard Series 80 software including statistics and engineering packages costing from £68 to £143. There are also four specialised programs for the HP86A. These are Visicalc Plus £178, Graphics Presentation £178, Basic Training Pack £68 and Word 80 £178. Plus the range of programs under CPM.

NAME	PRICE	USE	RAM	COLOUR	CPM	LANGUAGE	INTERFACE	SUPPLIER
Mimi 802	£1350	Business Education	64K	No	Com-patible	Most	RS-232C	British Micro 0923-48222/43956

COMMENT: British made micro with twin double sided, double density 5¼" disk drives included in the price. Colour coded keyboard with numeric keypad and 17 prgrammed function keys. Options include a Winchester hard disk, high resolution graphics and matching monitor with choice of orange or green display. Disk format conversion facility. Light pen socket.
SOFTWARE: Mimi uses OS/M as its operating system, which is compatible to CPM, so there is a wide range of programs already available including Wordstar. British Micro are developing Trojan — a major software innovation that simplifies the learning process and makes creating programs simple. British micro are already using this product themselves to generate new programs for the Mimi.

TECS	£1380	Business	56K	No	No	Most	RS-232	Technalogics 061-793 5293

COMMENT: Business micro which uses both the 6800 and 6808 processors. Monitor produces 80 column by 24 line display. Typewriter style keyboard with numeric keypad. Disk drives extra, example twin 5¼" floppy disk drives £850.
SOFTWARE: Limited amount of software as you are restricted to programs using FLEX TDOS.

TRS-80 Model 111 Business	£1399-£1699	Business	48K	No	No	Basic, Cobol Fortran	RS-232C	Tandy 0922-648181

COMMENT: Desktop machine incorporating 12" monitor, one or two 5¼" disk drives and a keyboard with separate numeric keypad. The TRS-80 Model 111 can be bought with one or two disk drives and an extra two can be added later on. In the USA TRS-80 was the first large selling microcomputer and it had been the largest seller until Sinclair came along.
SOFTWARE: Programs for the TRS-80 are available in a wider range than even Apple packages. Apart from the range of programs from Tandy, Molimerx have an extensive range of software for this micro. Most of the independents also have TRS-80 programs.

Signet 202S 211	£1400-£3435	Business Education	64K	No	Yes	Most	RS-232C	Micro APL 01-834 2687

COMMENT: Compact micro with twin 5¼" disk drives each 188K. Supplied complete with the Micro Span self-teaching interactive software system, claiming to take the beginner through the entire system in 14 days. Similar version available with double sided, double density disk drives at £1750. The 211 model replaces one of the 5¼" floppy disk drives with a 12Mbyte Winchester hard disk drive.
SOFTWARE: Using CPM a large range of packages is available including Wordstar. The APL Z-80 4.1 Interpreter and Micro Span self-teaching system costs £450. Microtask project development utility £200, Microfile data storage utility £200.

Galaxy 1	£1450	Business Education	64K	No	Yes	Most	RS-232C	Gemini 02403 28321

COMMENT: Two piece computer with the twin 5¼" floppy disk drives housed separately. Twin Z80 processors with each of the disk drives having 400K storage. 80 column display on monitor — extra — with pexel graphics facility. Cassette and light pen interfaces also supplied.
SOFTWARE: CPM is the operating system chosen for the Galaxy and supplied with each machine you have — Comal-80 structured Basic, GEM-Pen text editor formatter, GEM ZAP Z80/assembler and GEM DEBUG, a de-bugging utility.

Tuscan Dual	£1449-£2365	Home, Business Education	60K	No	Yes	Most	RS-232	Microsystems 01-405 5340

COMMENT: Supplied with either twin5¼" or twin 8" floppy disk drives and typewriter styel keyboard with 71 keys and separate numeric keypad. Additional monitor shows 64 columns and 32 graphics characters.
SOFTWARE: Using CPM many programs are available. Plus the Microsystems catalogue that contains over 100 packages.

C/WP Context	£1495	Business	64K	No	Yes	Most	RS-232	C/WP 01-630 7444

COMMENT: A business micro in a three piece system, monitor, keyboard and disk drives. Twin processors Z80A with 64K RAM and a 6502 processor with 32K memory which presents the results neatly on screen. IBM Style 83 keyboard, two double density half height 5" floppy disk drives.
SOFTWARE: Apart from using CPM as its operating system, the Context comes complete with Wordstar, the word processing package.

Kaypro 11	£1495	Business	64K	No	Yes	Most	RS-232	

COMMENT: Kaypro is another portable computer on the lines of the Osborne. However the Kaypro has larger capacity disk drives and a 9" monitor. The keyboard has a separate numeric keypad and there are programmable function keys. The entire system is housed in a steel case with the keyboard folding on top to provide a lid.
SOFTWARE: Although the Kaypro uses CPM, it's supplied with software ready to use. Microplan — a financial modelling package, Select — the latest word processing package and M-Basic a powerful programming language. Options include dBase 11, Spellguard and CPM programs.

Merlin	£1500	Business	48K	No	Extra	Basic	Centronics	CT Maddison 0993-73145

COMMENT: A single piece micro combining screen, keyboard and twin disk drives in one unit. The Merlin uses the Z80 chip and has a detachable 76 key keyboard, with numeric keypad and 5 programmable special function keys. The matt green screen provides a 64 x 16 line display. The twin disk drives offer from 200K to 1.5MByte capacity. As extras Maddison are working on CPM, am RS-232 interface, hard disk option and special hi-res graphics.
SOFTWARE: The Merlin uses LDOS and is supplied with Microsoft Basic in RTM. LDOS is Tandy's TRS DOS, so you can use the range of TRS-80/Genie software — an extremely wide range.

Powerhouse 2 & 3	£1535-£3220	Business	32-64K	No	No	Basic	RS-232	Powerhouse Micros 0442 48422

COMMENT: Two business micros both with 5" monitor and typewriter style keyboard. The Model 3 includes twin 5¼" floppy disk drives in its specification.
SOFTWARE: Range of specialised software only available.

Sord M-23P	£1560-£2060	Business	128K	Yes	Extra	Basic Pips 11 Pascal, Fortran	RS-232	Sord 01-930 4214

COMMENT: A micro small enough to fit in a custom made briefcase. The micro will have Sony type 'micro' floppy disk drives and there is an optional 8 line by 80 character display. Typewriter style keyboard with special function keys. The Sord 23P can produce graphics in 8 colours and the dot resolution is 640 x 200.
SOFTWARE: The M23P is supplied complete with Pips which Sord claim is an easy to learn self-programming system. And for an extra cost of around £50 you can buy SP80 — which is Sords version of CPM.

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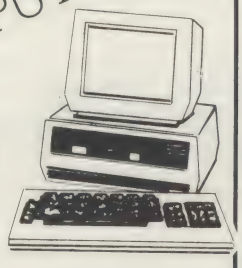
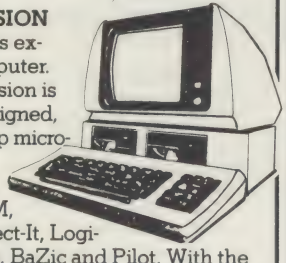
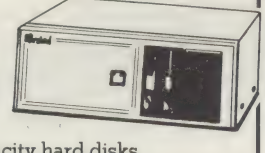


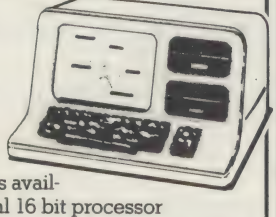
SIRIUS 1
The U.K.'s biggest selling 16 bit microcomputer ... with every reason – simply the best price/performance 16 bit microcomputer on the market. Includes 1.2mb disk storage, 400 x 800 graphics display, audio decoder, CP/M 86 and MS-DOS.



MICRO DECISION
Morrow Designs exciting new computer. The Micro Decision is a beautifully designed, compact desk-top microcomputer that comes packaged with CP/M, WordStar, Correct-It, LogiCalc, BASIC-80, BaZic and Pilot. With the addition of a printer the Micro Decision system has all the hardware and software necessary for word processing, proof reading, financial modelling and programming.

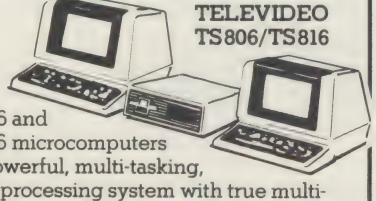


MINSTREL
The U.K.'s most competitively priced, S-100 bus based microcomputer with integral high capacity hard disks. Manufactured in England, the MINSTREL standard configurations include 800K-1.6 mb floppy and 5-20 mb of hard disk storage.



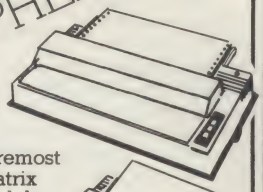
ADVANTAGE
Very compact, desk-top computer with high resolution graphics and dual processors. The Advantage is available with optional 16 bit processor and MS-DOS. Up to 64 Advantages can be networked with North Star's latest software/ hardware package, NorthNet.

EPSON HX-20 The first truly portable computer with full size typewriter keyboard, LCD screen, printer and microcassette facility actually built-in.

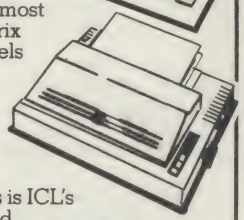


TELEVIDEO TS806/TS816
The TS806 and TS816 microcomputers are powerful, multi-tasking, multi-processing system with true multi-user capabilities. The TS806 and TS816 systems support up to 6 and 16 users respectively.

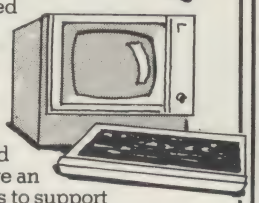
INTEDAM PERIPHERALS



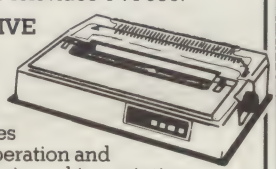
MX80F/T and MX100 Epson are the world's foremost supplier of dot-matrix printers. Both models can print four character pitches and have high resolution bit image graphics.



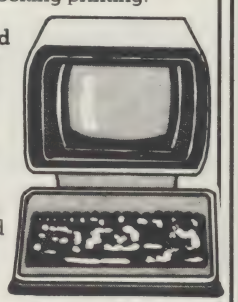
ICL KDS7362 This is ICL's latest VDU designed for the microcomputer market. The KDS7362 is very good value, reliable and attractively designed. Supplied with every VDU are an extra set of keycaps to support several foreign languages. Firmware compatible with Televideo TVI-950.



TEC EXECUTIVE 40R and 55R.
Superior, inexpensive daisy wheel printers. Features include quiet operation and bi-directional, logic seeking printing.



INSIGHT VDT-6 and VDT-8 Very competitively priced 'WordStar' VDUs. The VDT-6 and VDT-8 have 12" and 15" screens respectively. Both models incorporate a WordStar customised keyboard for use with MicroPro's excellent word processing system or with general purpose software. Firmware compatible with Televideo TVI-912.



FLOWRITER RP1300 and RP1600 The RP1300 and RP1600 are high performance, reliable, daisy wheel printers with print speeds of 37 and 60 cps respectively. The Flowriter's internal microprocessor controls proportional spacing, logic seeking, margin justification and internal 8K RAM buffering.

PRISM 80 and 132 The PRISM is an intelligent, high quality dot-matrix printer. Special PRISM features are colour printing, correspondence mode and single sheet feed capability.

INTEDAM SOFTWARE

WORDSTAR: The biggest selling word processing program. "The de facto standard for microcomputers" according to Microcomputing magazine. MicroPro's WordStar is supplied complete with comprehensive manual and training guide. We also supply the complete range of MicroPro software.

EXACT: Complete businessman's accounting system. High quality, inexpensive package comprising stock recording; invoicing; sales, nominal and purchase ledgers; and payroll. Superb value for money.

dBASE II: One of the world's foremost programmable data base management packages. Ashton Tate's dBase II has comprehensive file handling, screen handling and report printing facilities. Interfacing to files created by other languages such as BASIC or WordStar is supported.

AUTOCODE 1: The obvious complement to dBase II from British authors Stemmos. Autocode 1 is an automatic programming system for CP/M based microcomputers. Autocode 1 generates program code for complete systems executed directly under dBase II.

MULTIPLAN: MicroSoft's latest package. Multiplan is an easy to use, powerful electronic worksheet program, designed with non-computer people in mind. Supplied complete with comprehensive training guide and reference manual. We also supply the complete range of MicroSoft software.

CIS COBOL: Powerful implementation of the COBOL language for microcomputers from Micro Focus, in England. Also available are the excellent Forms II and Animator packages to aid program development.

HORIZON: Excellent business accounting system from Horizon Software. Designed to be operational in minutes by non computer oriented personnel. The system is fully integrated and is capable of producing an extensive range of managerial reports.

RESCUE: Very powerful non. programmable DBMS capable of handling applications from mailing lists and client records to stock control and time sheets. Aimed at non computer oriented personnel Rescue uses simple English - the user defines how required information is to be stored, displayed, sorted, analysed and printed. Designed and developed by Microcomputer Business Systems, in the U.K.

CBASIC: Commercial BASIC language compiler/ interpreter designed specifically to develop business applications. Also available is CB-80 - CBASIC machine code compiler and CBASIC86 - 16 bit CBASIC, to run under CP/M86. We also supply the full range of Digital Research software.

SUPERCALC: Probably the most popular CP/M based electronic worksheet program. SuperCalc makes it possible for decision makers to manipulate data quickly, setting up exactly what is necessary for in-depth analysis and financial modelling. With a minimum number of commands to get the maximum power and full screen help menus called up only when required, SuperCalc is very easy to use.

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NAME	PRICE	USE	RAM	COLOUR	CPM	LANGUAGE	INTERFACE	SUPPLIER
Research Machines 380Z	£1601-£3347	Home Education Business	32-56K	Extra	Yes	Basic Forth	RS-232 IEEE 488	Research Machines 0865-49866

COMMENT: The RML range has sold largely to schools and colleges with its CPM operating system and wide range of interfaces. It has been included in the Department of Industry Micros in Schools Scheme. The basic micro consists of the typewriter style keyboard with separate disk drives. A wide range of plug-in boards extend the RMLs possibilities. It can be bought complete with monitor and can load programs and data from disks or cassettes. To reduce the cost of an RML outfit, deduct the cost of the drives and load your programs from a cassette recorder.
SOFTWARE: Apart from range of programs available under CPM, RML also supply a catalogue of software from a wide range of independent companies. Currently there are over 75 programs covering education, games, commercial and financial programs and statistics. Prices range from £5 to £80.

Televideo TS1600	From £1629	Business	128K Plus	No	CPM86	Most	RS-232	Encotel 01-680 6040

COMMENT: Televideo's first entry into the 16 bit world, using the 8088 chip. The TV1600 series range from a single work-station right through to a multi-user system with satellite user stations. The basic 16 bit range comprises the computer including monitor and disk drives in a single unit. Options on hard disk storage go to 10Mbytes and more. This 16 bit Televideo can plug into your existing 8 bit system.
SOFTWARE: A limted but increasing number of business programs are becoming available for 16 bit micros covering most fields.

Epson QX-10	£1700	Business	192-256K	No	Com-patible	Most	RS-232C	Epson 01-900-0466

COMMENT: A business machine from the people who brought you the briefcase size HX-20. Using the popular Z80A chip, the system is compatible with CPM. Standard typewriter style keyboard with separate numeric keypad plus special function keys. 12" green screen monitor with non-glare screen and 80 character by 25 line display. 640 x 400 pixels for greater resolution. Twin 5¼" floppy disk drives each 320K. Graphics capability has zoon facility. Up to five extra interface cards can be used to expand the system. Clock and calendar with battery back-up. Designed for first time users.
SOFTWARE: Compatibility with CPM opens the door to an almost unlimited range of programs.

Hewlett Packard HP87	£1739	Business	32-544K	No	Yes	Most	RS-232	Hewlett Packard 03446-3100

COMMENT: Single piece desktop business micro with integral monitor for 24 line display combined with typewriter style keyboard having separate numeric keypad and special function keys. Can be connected to mainframe computers. Program loading and data storage from separate 5¼" floppy disk drives with hard disks available as optional extras.
SOFTWARE: Accepts the Hewlett Packard range of Series 80 software including statistical and engineering packages, programs under CPM, plus Visicalc Plus, Graphics Presentation and Word 80 each £178 and Basic Training pack £68.

Xerox 820 & 820-11	£1750-£2350	Business	64K	No	Yes	Most	RS-232	Rank Xerox Uxbridge 51133

COMMENT: Based on the Z80 chip, the Xerox 820 range is a three part system comprising monitor, keyboard and floppy disk drives. The new 820-11 has a monitor with 80 character display with green on black option. The keyboard is typewriter style with a separate numeric keypad. Though the 820 is supplied with 5¼" drives, 8" drives and hard disks can be used. Provision for communication with other micros making the 820-11 an intelligent terminal.
SOFTWARE: Apart from the range available under CPM, Rank Xerox also have a wide range of application programs in their catalogue.

Digico Price 11	£1790-£5500	Business	64K	No	Yes	Most	RS-232	Digico 04626-78172

COMMENT: Models range from the basic without any drives to a combination of 800K 5¼" floppy disk drive and 5Mbyte hard disk. Extensive facilities for expanding the system to multi-user, multi-terminal use.
SOFTWARE: Apart from packages available under CPM, Digico also produce a range including ones for company sales, company purchase, general accounting, lease, rental and hire purchase, name and address, order entry and invoicing, payroll, stock control, time recording, word processing, integrated business systems, sales administration and bills of quantity.

Apollo	£1795-£1995	Business	64K	No	Yes	Most	RS-232	Videcom 04912-78427

COMMENT: Business computer with adjustable angle monitor built-in and 15" screen. Choice of twin 5¼" floppy disk drives with either double sided/double density or double sided/quad density, a total capacity of 1-2 Mbytes. Keyboard has typewriter style approach with 102 keys with rollover facility. Numeric pad, editing and cursor control keys, Wordstar control keys. This keyboard is detachable. Monitor display 26 lines by either 80 or 132 characters.
SOFTWARE: Use of CPM as the operating system assures a good choice of programs for most applications.

Haywood 9000	£1795	Business	64K	No	Yes	Basic	RS-232C	Haywood Electronics 01-428 0111

COMMENT: Desktop micro computer with detachable keyboard, using twin 5¼" floppy disks mounted alongside the 12" monitor producing an 80 column display. W version available with Winchester hard disk for greater data storage. Plug-on Wordstar keyboard available. Sculptured keyboard with numeric keypad and 35 special function keys.
SOFTWARE: Using CPM as an operating system, the Haywood 9000 has access to plenty of programs from Wordstar to the most sophisticated applications package.

System M-Three	£1795-£4750	Business	64K	No	Yes	Most	RS-232	LSI Computers 04862-23411

COMMENT: British made single piece micro with detachable keyboard. Cabinet houses the 12" green screen monitor and twin disk drives. These disks can be single, double or quad density. Another version of the System Three uses 8" disks and for even more storage you can also use a 10Mbyte Winchester hard disk. The monitor produces an 80 column display with graphics. The keyboard has 109 keys including the standard QWERTY plus editing, cursor control and 24 programmable functions plus a numeric keypad. Looks ugly and is incredibly heavy but with good software it can be a robust workhorse.
SOFTWARE: System M Three uses CPM and the following programs are available from LSI: A modular accounting package, word processing, prospect mailing and the Oasis range of accounting programs.

Superbrain 11	£1800-£4360	Business	64K	No	Yes	Most	RS-232	Icarus 01-485 5574

COMMENT: Single unit housing 12" monitor, twin disk drives and typewriter style keyboard with numeric keypad. Twin Z80 processors for efficient data transfer to other peripherals like printers. Real time battery operated clock. Three versions with 5¼" floppy disk drives of increasing capacity up to £2415. W range replaces one of the 5¼" floppy disk drives with a 5 or 10Mbyte Winchester hard disk.
SOFTWARE: The Superbrain uses the CPM operating system which covers most applications from Wordstar and Spellbinder for world processing to the most specialised use.

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NAME	PRICE	USE	RAM	COLOUR	CPM	LANGUAGE	INTERFACE	SUPPLIER
Hewlett Packard HP125	£1845-£2690	Business	64K	No	No	Basic	RS-232	Hewlett Packard 03446-3100

COMMENT: The HP125 uses twin 5¼" disk drives to provide 512K of on-line storage. The Model 20 in this series uses 8" disks and other versions are available that include a green screen monitor and thermal printer. Detachable typewriter keyboard with separate numeric keypad and eight user definable keys.
SOFTWARE: Visicalc 125 on 5¼ and 8" £134, Graphics both sizes also at £134. Word 125 available in both versions price £336. Link 125 at £84. Basic 125 £218 and HP125 programming pack £50.

Future FX-20	£1850	Business	128K	No	Yes	Most	RS-232	Future 01-689-4341

COMMENT: A British IBM lookalike and thinkalike, at an extremely attractive price which includes a word processing package. Though the machine uses the 8088 chip just like the IBM PC, the Future runs this chip at 8 Mhx. and that's fast indeed. Monitor can be adjusted for viewing angle providing an 80 column by 25 line display using a high definition 16 by 10 dot matrix for each character. Twin 5¼" floppy disk drives with total capacity of 1.6Mbytes. Part of a complete Future computers system. Typewriter style keyboard with special function keys and numeric keypad.
SOFTWARE: Spellstar – the word processing package is supplied free of charge. Apart from the increasing range of packages available under MS/DOS, an 8 bit emulator for CPM will be available opening the door to over 2000 programs.

Grundy 8202/ 8222	£1850-£4500	Business	64-256K	No	Yes	Most	RS-232C	Micro Memory Systems 0635-40405

COMMENT: The Grundy is a two piece computer with twin disk drives and a 12" monitor housed in a single cabinet. The typewriter style keyboard is separately connected by a short lead. This keyboard has numeric keypad. Both the drives are 5¼" of 0.5Mbyte capacity. The 12" green screen monitor shows an 80 column display. The model 8222 replaces the twin floppy disks, with one floppy and one Winchester hard disk which can be 6, 12 or 18Mbyte depending on the application. Security lock to prevent unauthorised use.

Sord M23 Mark 1/111/V	£1870-£3776	Business	128K	Yes	No	CBasic	RS-232C	Sord 01-930 4214

COMMENT: Three business micro systems sharing the choice of monochrome or colour monitors and only differing in their choice of disk drives. The Mark 1 uses the micro-floppy disk and costs £1870 with BW monitor, £2266 with colour. Mark 111 uses the 5¼" floppy disk drive costing the same price as the Mark 1. The Mark V uses 8" floppy disks and costs £3380 with BW monitor and £3776 with colour. All models have twin disk drives, typewriter style keyboards and also use Sords own graphics language SGL. The SGL plugs in with a cartridge having its own 64K RAM making a total of 192K.
SOFTWARE: You can create your own programs with the Sord PIPS self programming language. Sord also produce a range of plug-in cartridges so you can use the M23 without floppy disks. First programs will be PIPS, Basic and a word processing package.

Comart Communicator CP range	£1895-£2495	Business	64K	No	Yes	Most	RS-232	Comart 0480 215005

COMMENT: Basic computer, keyboard and monitor extra. Built-in expandability including being ready for Prestel and Viewdata. Twin 5¼" floppy disk drives each with 390K capacity. Seven expansion slots for growth. CP200 has higher capacity disks at £2495.
SOFTWARE: Database management, word processing, production and stock control, business systems and financial planning. CAP Application software for: invoicing, sales, purchase, nominal ledger, payroll, inventory control. Plus the range of programs available under CPM.

Triumph Adler Alphatronic P	£1895-£2935	Business	From 48K	No	Yes	Basic, Cobol Fortran	RS-232	Triumph Adler 01-250 1717

COMMENT: The Alphatronic range were first introduced as word processors, with the other facilities added afterwards. The P2 is sold as a complete system including monitor and printer at around £2935. There's a typewriter style keyboard and twin 5¼" floppy disk drives. The P3 is sold as the Alphatronic Micro and has provision for using 8 or 16 bit software.
SOFTWARE: Wide range of programs available under CPM – plus an increasing range offered by Adler themselves.

Caltext 1/1A to 3/3A	£1899-£3845	Business	64-256K	No	Yes	Most	RS-232C	Computer Ancillaries Egham 36455

COMMENT: Range of single piece desktop business micros differing only in their disk capacity. All have detachable typewriter style keyboards and 12" monitors with 890 column display. The keyboards also have numeric keypads, plus special function keys for word processing. There is also provision for link-up with IBM mainframe computers. The Model 1 is 64K and the 1A is 256K. The 2 & 2A replaces one of the 5¼" floppy disks with a 5Mbyte Winchester and the 3 & 3A replace the 5Mbyte Winchester with a 10Mbyte hard disk.
SOFTWARE: Apart from the wide range of programs available with CPM Computer Ancillaries also supply the range of Oasis business software and Microplan.

Globe 101	£1900	Business	64K	No	Yes	Most	RS-232	Globe Business Machines 0934-835222

COMMENT: A single piece micro with special function keys that makes it ideal for using Wordstar. 12" green screen monitor with 80 column display and 24 lines length. Twin 5¼" disk drives with capacity of 1Mbyte unformatted. 100 keys on typewriter style keyboard with numeric keypad, plus special function keys. Provision for upgrading to the Globe 102 with twin 8" disks and to Globe 103 with Winchester hard disk.

Seed System One range	£1900-£2480	Business	From 32K	No	No	Basic, Cobol Assembler	RS-232	Strumech 054-33-78151

COMMENT: Business system based on the 6809 chip. There's a choice of either twin 5¼" drives or twin 8" drives. the System One is expandable to 56K and up to 8 input/output devices. Double headed version of the System One available. This was the first system of its type based on the 6809 chip.
SOFTWARE: Wide range of system software including text editor, processor, assemblers and compilers. Business packages available include stock control, sales and purchase ledger and a mailing program. You have the choice of separate modules or a fully interactive package.

Seed System 19	£1900-£4895	Business	32K-1MB	No	No	Basic, Cobol Pascal	RS-232	Strumech 054-33-78151

COMMENT: Uses the Motorola 6809 processor expandable from 32K to 1Mbyte. Choice of single user operating systems or the OS-9 multi-user/multi tasking system. Variety of storage from 5¼" floppy disks through 8" floppies to 10Mbyte hard disks. Monitor and disk drives extra.
SOFTWARE: Under the Microware OS-9 and SSB DOS 69 software there are a range of programs including Styleograph Word Processor (£130).

Hewlett Packard HP85A	£1917	Business	16-32K	No	No	Basic	RS-232	Hewlett Packard 03446-3100

COMMENT: Single piece desktop unit with built-in 5" monitor with 32 character display and thermal moving head printer. Typewriter style keyboard with separate numeric keypad and plug-in tape cartridges. Plug-on modules are also available for extending the memory.
SOFTWARE: Special Application packs are available for the HP80 series micros. They include general statistics, finance, application circuit analysis, linear programming, wave form analysis and statistical programs. All costing £68. The HP85A also has Visicalc Plus, File Manager, and Graphics Presentation as three of a range of programs all costing around £140.

NAME	PRICE	USE	RAM	COLOUR	CPM	LANGUAGE	INTERFACE	SUPPLIER
Toshiba T200	£1950	Business	64K	Extra	Extra	Most	RS-232	Office International Sunbury 85666

COMMENT: Two part business system with the monitor and disk drives in a single package with a detachable keyboard. 12" green screen monitor with 80 character by 25 line display. Twin 5¼" floppy disk drives each 280K. Typewriter style keyboard with separate numeric keypad and special function keys. Also available in outfit complete with choice of printer.
SOFTWARE: Apart from the wide range available under the optional CPM, Office International have their own range of business programs covering most applications.

Zenith Z100 range	£1973-£2467	Business	128-768K	Yes	Yes	Most	RS-232	Zenith 0452-29451

COMMENT: Single piece micro with both 8 and 16 bit micro processors, incorporates single 5¼" disk drive with 320K capacity. High-resolution graphics with facilities for resolution of 320,000 dots normally found only with dedicated graphics terminals. Multi-user capability and compatible with mainframe computers. Another version has twin disk drives and costs £2453. The 120-22 Zenith is a single piece system that incorporates the monitor and twin 5¼" drives in a single cabinet. The monitor produces an 80 column display. The 120-22 costs £2467.
SOFTWARE: Apart from the vast range of programs available under CPM and the newer ones under CPM 86, Zenith also supply their own electronic spreadsheet costing £135.

Transtec BC2	£1975-£2400	Business	64K	No	Yes	Most	RS-232	Transtec 0272-277462

COMMENT: Single unit computer with all three components, monitor, twin disk drives and keyboard housed in a single cabinet. 12" green screen monitor with 80 column display. Typewriter style keyboard with eight way cursor control, nine special function keys and numeric keypad. Capacity of 5¼" disk drives 800K. Eight multi-level expansion connectors. The outfit comprises the BC2 plus a choice of printer depending on the package chosen. The Olivetti DM5050 print head matrix printer operating at 100 characters per second is used for all the packages apart from word processing. The word processing package uses the Smith Corona daisy wheel printer.
SOFTWARE: Transtec financial package comprising BC2, Olivetti printer and Calcstar £1975. Total Database includes the same hardware plus the Datastar set of programs £1990. Transtec word processing package includes the BC2, Smith Corona daisy wheel printer and word star, £1990. Transtec total accounting package including the BC2, Olivetti printer and Business Desk a fully integrated accounting software suite £2400.

Philips P2000	£1990	Business	16-48K	Yes	No	Basic	Other	Philips 01-580 6633

COMMENT: Business micro that can run programs from cartridges or floppy disks and can accept data from cassettes. 12" green screen monitor with twin 5¼" floppy disk drives. 80 column display shown on the monitor with full colour graphics. The P2000 has slots for insertion of program cartridges and a special slot for mini-cassettes which can hold up to 39,000 characters per side. Typewriter style keyboard with separate numeric keypad and special function keys.
SOFTWARE: Range of special programs covering Payroll, nominal ledger, purchase ledger, stock recording, sales ledger and analysis ledger. Prices of individual programs averages £150. A special word processing package costs £230, while the BIS – Information System, has just been launched which has a universal application from graphics to moving effects, set up announcements and can be used for presentations and training. Price on request.

CAL PC	£1995	Business	128K	No	Yes	Most	RS-232	Computer Ancillaries Egham 36455

COMMENT: Another British IBM lookalike with the extra feature of including a Z80 processor so that 8 bit programs can be run until large numbers of 16 bit programs become available. So it's a dual 8-16 bit machine around the same price range as the Future FX-20, without any software included in the price. 80 column display, typewriter style keyboard with numeric keypad and special function keys. Versions to be available that incorporates hard disks replacing one of the floppy disks.
SOFTWARE: Add the vast choice of CPM programs to the increasing number for the IBM PC and there's an ample choice for people buying the CAL PC.

TMK 320/330	£1995-£3195	Business	64K	No	Yes	Most	RS-232	Peripheral Hardware 021-745 3033

COMMENT: Single piece units from Nippon Univac, sharing the features of typewriter style keyboard and numeric keypad. Each has a green screen monitor and 4K of shadow ROM for start-up hardware diagnostics. The keyboard also has 22 programmable keys. Twin 8085 processors are used allowing separate processing of input and output data. The TMK 320 uses twin 5¼" floppy disk drives mounted horizontally, while the TMK 330 has twin 8" drives mounted vertically.
SOFTWARE: Apart from the range of software under CPM, there is also a range of Nippon Univac software available from Peripheral Hardware.

Director System	£1999	Business	64K	No	Yes	Most	RS-232C	Anglotech Slough 74201

COMMENT: Desktop micro with built-in 7" monitor and twin double sided, double density 5¼" floppy disk drives and detachable keyboard. Can also linked to Anglotech hard disk system. 16 bit video RAM allows the system to be Prestel compatible.

£2,000-£3,000

NAME	PRICE	USE	RAM	COLOUR	CPM	LANGUAGE	INTERFACE	SUPPLIER
Wang Professional	From £2000	Business	128-640K	No	Yes	Basic, Cobol Fortran, Pascal	RS-232	Wang 01-560-4151

COMMENT: True 16 bit machine using the 8086 chip. Self-test at power on, with parity checking. Choice of single or dual 5" disk drives. 360K per drive. Optional 5Mbyte hard disk. Green on black monitor producing 80 column display. Detachable keyboard with 101 key unit, 16 programmable function keys, numeric keypad and cursor control keys. Work station emulation.
SOFTWARE: PC Multiplan and Wang PC Word processing plus the increasing range of programs available under MS-DOS. And the CPM range made available through the CPM80 emulation.

IBM Personal Computer	From £2080	Business Education	64-256K	Extra	Extra	Basic, Cobol Fortran Pascal	RS-232	IBM UK 0705-694941

COMMENT: Now officially available in the UK, the IBM Personal Computer is destined to be a mass seller in 1983 due to the reputation of the letters IBM. Available in its smallest system with a single disk drive of 160K. With provision for using drives with twice that capacity. Using the 8088 chip, the IBM is a three part system with monitor, processor and keyboard. 80 character green screen monitor with adjustable angle typewriter style keyboard with separate numeric keypad. Provision for colour graphics facility. Diagnostic system checks machine automatically as soon as it's turned on. Now officially here, the competition for the lookalikes will be even more intense.
SOFTWARE: As increasing number of programs are available for MS-DOS and CPM86. Popular programs already available to fit the IBM PC include Micromodeller, Visicalc, Wordstar and TIM III. Systemics and Tab products will also be available.

NAME	PRICE	USE	RAM	COLOUR	CPM	LANGUAGE	INTERFACE	SUPPLIER
Haywood 3000	£2100	Busines	64K	No	Yes	Most	RS-232C	Haywood Electronics 01-428 0111

COMMENT: Single board computer with separate disk drive unit and monitor. Programmable counter/timer with four channels. The Twin disk drive unit takes 5¼" disks which have a capacity of 350K per drive. This equals 130 pages of A4 on each disk.
SOFTWARE: Micromass business programs are fully integrated through stock control, invoicing, sales and purchase ledger. The entries, payroll, management accounts, P11D through to trial balance complete this powerful business system. Plug CP/M.

System M-Four	£2150	Business	128-256K	No	Yes	Most	RS-232	LSI Computers 04862 23411

COMMENT: Two systems in one with the 8088 16 bit chip and the Z80 8 bit chip, offering the choice of either type of operation. Single unit with detachable keyboard. Range of disk drive options from 5¼" floppies to hard disks. Up to three concurrent users. 12" monitor with green screen, graphics facility plus 80 column display.
SOFTWARE: The System M-Four uses five operating systems MSDOS, CPM, CPM86, MPM86 and LSI NET for wide range of programs.

North Star Advantage	£2195	Business	64K	No	Yes	Basic Fortran Cobol	RS-232C	Comart 0480 215005 Trader Computers 01-328 3484

COMMENT: Desktop machine with 12" green screen monitor, twin 5¼" floppy disk drives and Selectric style keyboard in a single cabinet. Monitor offers choice of 80 character display or bit-mapped graphics from simple line charts and bar charts to three dimensional charts nd complex three dimensional forms. Typewriter style keyboard has 87 keys including 15 special functions and 14 key numeric keypad. Versions available with Winchester hard disk and upgrade to 16 bit (£345).
SOFTWARE: North Star Application Support Orogram Operating system provides sequential and random file management for North Star packages:- ACCPAC order entry/invoices, accounts receivable and payable, general ledger, Northword a word processing package. Mail manager for mailing list management and Info management for Data management. Plus CPM.

Saracen	£2200	Business	32K	No	Yes	Most	RS-232	Bytronix 0252-726814

COMMENT: Using the popular Z80 processor the Saracen comes with two 5¼" floppy disk drives and 8" disk drives available as an option.

Pasca 640	£2200	Business	64K	No	Yes	Most	RS-232C	Westrex 01-578 0950

COMMENT: Single unit micro with twin disk drives, 8" IBM format, green screen monitor and keyboard with separate numeric keypad, all housed in a single cabinet. Typewriter style keyboard with 18 special function keys for user defined operations or CPM control sequences.

Acclaim	£2225-£4450	Business Education	64K	Extra	Extra	Most	RS-232	Country Computers 0527-29826

COMMENT: If you wanted an Apple 11 Plus, but weren't satisfied with the 40 column display, extra monitor and limited disk storage, the Acclaim is the answer. In a single cabinet you have a green screen monitor and a choice of single 5¼" disk drive, twin floppies right up to Winchester hard disks. The keyboard is detachable and has a separate numeric keypad, plus 12 programmable function keys. The monitor gives you the choice of 40 or 80 character displays, so you have all the Apple compatibility plus extra features in a single unit.
SOFTWARE: The Acclaim accepts all the Apple software, so you have a choice that's virtually unlimited, plus when you add the Z80 softcard CPM packages become available.

Quantum 2000	From £2250	Business	64K	No	Yes	Most	RS-232 Centronics	Quantum Computer Systems 0532-458877

COMMENT: Two part British made computer system which has the green screen monitor mounted above the typewriter style keyboard. The disk drive unit has three drives built-in — unusual as most have just the two drives — but can be useful for business use. 2.4Mbyte of formatted storage capacity. Monitor shows 80 columns by 25 lines format and 160 x 75 pixel graphics.

Sanyo MBC 2000/ 3000	£2250-£3500	Business	64K	No	Com-patible	Basic Pascal Cobol Fortran	RS-232	Sanyo Watford 46363

COMMENT: Two desk-top single piece business micros both using the 12" green screen monitor and having typewriter style keyboards with numeric keypads and special function keys. The MBC-2000 has twin 5¼" floppy disk drives and the MBC-3000 has twin 8" floppy disk drives. Commercially available Multi-bus cards can be used for further expansion.

Husky	£2280	Business	32-144K	No	Yes	-	RS-232	Datec 061-941 2361

COMMENT: Business micro with built-in monitor producing 32 column display. Full typewriter style keyboard with dual function keys and numeric keypad. Disk drives extra.
SOFTWARE: Using CPM there can be an extensive range of programs available though certain software will be very difficult to use with 32 column display.

Cromenco System 1/2	£2295-£2620	Business Education	64-512K	Yes	Com-patible	Most	RS-232	Comart 0480 215005

COMMENT: Desktop system needs keyboard and monitor are essential extras. 8 slots of expansion. Twin 5¼" floppy disk drives. The System 2 is designed for rack mounting and has 17 slots for expansion. Both micros produce colour graphics using the SD1 interface, with 16 shades of 256 colour ranges, giving a total choice of 4096.
SOFTWARE: Packages available for Database management, word processing, CAP applications, sales ledger, invoicing, purchase and nominal ledger, payroll and inventory control. Plus CPM.

Enterprise 1000	£2300	Business	64K	No	No	Most	RS-232C	Data General 01-572-7455

COMMENT: Single piece business micro with twin 5¼" drives having a capacity of 358K formatted. Typewriter style keyboard with numeric keypad and special function keys.
SOFTWARE: Using Enterprise OS, MP/OS or BOSS, there is a wide range of specialised application programs available.

Eagle II-III-IV	£2350-£4195	Business	64K	No	Yes	CBasic	RS-232	Mediatech 01-903 4372

COMMENT: Range of single unit business micro computers with 12" monitor showing 80 column display, twin 5¼" floppy disk drives and a keyboard with separate numeric keypad. The models differ only in their storage capacity with the greatest storage available on the Eagle IV.
SOFTWARE: All the Eagle range are sold as complete packages with software. You have the choice of an Office Management configuration which includes Spellbinder the word processing package, an electronic spreadsheet, Ultracalc and MBasic. While the business configuration also has Spellbinder plus the Accounting Plug suite of programs. Prices range from the £2350 for the office management system with the Eagle II to the Eagle IV at £4195 also with the office system. Accounting packages are priced between £2350 and £4195 depending on the disk capacity.

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NAME	PRICE	USE	RAM	COLOUR	CPM	LANGUAGE	INTERFACE	SUPPLIER
DEC Rainbow 100	£2359	Business Education	64-256K	Extra	Yes	Most	RS-232	Digital Equipment 0256-59200

COMMENT: The Rainbow uses the Z80 and 8088 chips, so you have a dual 8-16 bit machine which automatically senses the type of program and selects the correct processor. Complete system including the disk drives, monitor and typewriter style keyboard. There are two 5" disk drives, and optional Winchester hard disks. The 12" monitor produces an image 80 columns wide with an optional colour monitor available. The ergonomically designed keyboard has special function keys and a numeric keypad.
SOFTWARE: Using a combination of CPM and CPM 86, you have a wide choice of 2000 programs plus the ones available through the DEC catalogue. So if you want a machine to use for the future, the DEC Rainbow is a good choice.

Ferranti PT7 Model 265	£2395	Business	128-896K	Extra	Yes	Basic, Cobol Pascal	RS-232	Ferranti 061-499-3355

COMMENT: This machine using the 8086 chip is the Ferranti version of the PT7 range of IBM and ICL compatible terminals. With twin 320K 5¼" floppy disk drives and an 800 x 400 bit mapped graphics display, the PT7 is extremely competitively priced with the Sirius I, though less disk storage. Typewriter style keyboard with special function keys and numeric keypad. Offers multi-tasking foreground/background operation. Higher capicity disk drives available. Optional printers also available.
SOFTWARE: Using CPM86 and MPM86, there is a wide range of packages available, plus a range for the PT7 from Ferranti.

Millbank System 10	£2395 - £2895	Business Education	65K	No	Yes	Most	RS-232 IEEE 488	Millbank Computers 01-788 1083

COMMENT: Single piece desktop machine with 12" monitor showing an 80 column display, with twin 5¼" disk drives and a typewriter style keyboard with separate numeric keypad. Power down protection device. 32 bit arithmetic processor. Direct memory addressing makes the system 10 faster than other micros claiming 4 MHZ processing speed. Can be used with the Millbank CTX10 Telex system. Using this system the CTX10 can be combined with other CPM based packages to offer a simultaneous word processing, business computing/telex combination. The CTX costs £1600. The System 10 is also available with a 5 Mbyte hard disk.
SOFTWARE: Apart from the CPM based software that can be used with the System 10, Millbank have these specialised packages: -Financial Director — a complete suite of interactive British Accounting Software, R.E.A.M.I.S. — Residential estate agents management information system, Instrumention/Process control — a range of scientific/industrial packages for specialist users, Solicitors — User specific data retrieval/word processing package utilising standard legal terms and phraseology.

Olivetti M20	£2395	Business Education	160-500K	No	Extra	Basic Pascal Fortran	RS-232 1EEE 488	Olivetti 01-785 6666

COMMENT: True 16 bit micro with twin 5¼" disk drives above an Olivetti typewriter style keyboard which has a separate numeric keypad. Monitor supplied, fully adjustable, in green or monochrome. Provision for using Winchester hard disks up to 11 Mbytes. Full graphics facility outside RAM. Wide range of printers available.
SOFTWARE: The M20 uses MSDOS and PEKOS, CPM 86 will be available soon. Olivetti already have a full range of accounting packages for the M20, plus Multiplan £175, Oliword £300, Oliterm a TTL emulator £150 and Oli Com a communications program £300. The Olivetti catalogue contains around 100 programs.

Sirius 1	£2395	Business Education	128K-1MB	Extra	CPM86	Basic Cobol Fortran	RS-232C 1EEE 488	ACT 021-501 2284

COMMENT: Certainly the most publicised 16 bit computer apart from the IBM, which isn't even officially imported yet by IBM. Using the Intel 8088 chip offers far more possibilities and expansion to 1 Mbyte. The Sirius is self-contained with its own 12" green screen monitor showing 80 or 132 characters to the line. The twin 5¼" disk drives have a total capacity of 1.2 Mbytes. While the keyboard features an IBM style nucleus with separate numeric keypad. Hi-res graphics included for charts, graphs and half tone pictures. Codec audio controller for verbal prompts and operating instructions. Ergonomically the monitor screen tilts and swivels and has a glare proof screen. The keyboard is separate.
SOFTWARE: CPM 86 is the latest version of the popular operating system. Already you have Micromodeller, Supercalc, Wordstar, Spellstar and Mailmerge available. In addition ACT themselves have developed the range of Pulsar business programs.

Victor 9000	£2395	Business	128-896K	No	CPM86	Basic Cobol Fortran Pascal	RS-232	DRG Business Machines 0934 415 398

COMMENT: See Sirius. Victor Business Machines produce the Sirius and Victor 9000 computers. Victor have the sole rights for the machine under this name in North America and the UK. Feature for feature the hardware is identical apart from the name.
SOFTWARE: Special software will be available under the Victor name — Victor Writer and Victor Calc and companies like Pegasus and Peachtree will also be supplying packages for this machine. Plus all the software that is available for the Sirius I and of course vice-versa.

ICL Models 10, 30, 31, 32	£2395-£5250	Business	64-256K	No	Yes	Most	RS-232C	Trader Point 01-788 7272

COMMENT: Range of micros ranging from the twin 5¼" floppy disk drives to hard disks. Available without kehyboard or monitor or as system.
SOFTWARE: CPM, plus range from ICL.

Apple 111	£2418	Business Education	128-256K	Extra	No	Basic Pascal Cobol Assembler	RS-232	Apple UK 0442-60244

COMMENT: Big brother to the best selling Apple 11 Plus, the Apple 111 hasn't had the same success. Having a typewriter style keyboard and separate numeric keypad, the Apple 111 uses a new type of operating system known as SOS — Sophisticated operating system. There is one disk drive built-in with provision for another three to be used. A special hard disk known as Profile gives a storage capacity of 5 MBytes and up to four can be used with the Apple 111. Unlike the Apple 11, the model 111 provides an 80 column display on a special green screen monitor supplies as part of the system. There is a special emulation mode to let you use Apple 11 software on this new model. so the Apple 111 offers the features of a larger machine plus access t the best selling packages for the model 11.
SOFTWARE: Apart from the vast supply of Apple 11 software that can be used in the emulation mode, there is a limited range specifically for the Apple 111.

Altos 5-15 & 5-50 range	£2425-£4950	Business	192K	No	Com-patible	Most	RS-232C	Logitek 0257 426644

COMMENT: Single board computer requiring keyboard and monitor for use. Suplied with two double sided 5¼" floppy disk drives in single cabinet. With the 5-50 range one of the floppy disk drives is replaced with a 5¼" Winchester hard disk. Up to three users can use the system.
SOFTWARE: Logitek supply the range of Peachtree software for the Altos range. These programs cover — sales ledger, inventory management, payroll, nominal ledger, purchase ledger. Plus the extensive range of programs available under CPM. There is also the MPM operating system used by Altos the multi-tasking/multi-user version of CPM.

NAME	PRICE	USE	RAM	COLOUR	CPM	LANGUAGE	INTERFACE	SUPPLIER
Logica VTS	£2499	Business	64-512K	No	Yes86	Basic, Pascal Cobol	RS-232	Logica 01-637-5171

COMMENT: Using the true 8086 chip, the VTS is a three part system. The monitor has a 15" screen and bronze display. Twin 5¼" floppy disk drives giving 500K storage. Typewriter style keyboard with numeric keypad and 12 programmable special function keys. The 15" monitor matches the height ergonomic standards set by the Logica word processor.
SOFTWARE: An increasing amount of programs are becoming available under CPM86.

Canon CX-1	£2500	Business	64-128K	No	No	Basic, Cobol Assembler	RS-232C	Canon 01-680-7700

COMMENT: Single unit micro comprising 12" green screen monitor, twin 5¼" floppy disk drives and typewriter style keyboard with separate numeric keypad. Each disk has information storage of 320K and a maximum of 128 programs can be stored on each disk. Uses the Canon MCX operating system, which includes text formatting and a spool function to save data for printing out later. 8" drives available as optional extras plus printers.
SOFTWARE: Special programs for the CX-1 are available from Canon and outside sources. Holland Automation programs cover sales ledger, purchase and general ledger, payroll and stock recording. Each program costs £275. Plus the Filekeeper foundation package for the other programs costing £135. Other programs available from Holland Automation include Report Generator, Bill of materials, General Ledger, Budgets.

Sage II-IV	£2995-£5395	Business	128K-1Mbyte	Extra	No	Most	RS-232	TDI 0272-742796

COMMENT: Using the 68000 16/32 bit processor the Sage micro offers increases in speed claimed to be better than most other brands. Supplied in the form of the processor and one or more disk drives, the Sage IV can also be supplied with one floppy and one hard disk, or up to 4 Winchester disk drives. Memory is increased from 512K in the Sage II to 1Mbyte with the Sage IV.
SOFTWARE: Sage is supplied with the UCSD-P system and can also be used with CPM68K, BOS and Mirage APL. Software used on Sage is claimed to be up to 14 times faster than when used on the Apple, and up to 4 times faster than 8088 micros like the Sirius and IBM PC.

Tele Video TS800 range	£2535-£4225	Business	64K	No	Yes	Most	RS-232	Encotel Systems 01-686-9687

COMMENT: Two models, TS802 and TS806, the second model has the multi-tasking facility. Either system comes complete with twin 5¼" floppy disks which are combined with the 12" green screen monitor with 80 column display. Typewriter style keyboard with numeric keypad and special function keys, detachable from main unit. Versions of these micros are also available with optional Winchester hard disk systems from 5Mbyte, 10Mbyte to 20Mbyte. There's also a new 0.8Mbyte floppy disk drive available.
SOFTWARE: CPM as the standard operating system means an ample choice of programs.

Minstrel	£2550-£3200	Business	64K	No	Yes	Most	RS-232	Hotel Microsystems 01-328 8737

COMMENT: Single unit machine that incorporates both a 5¼" floppy disk drive and a choice of either 5 or 20MByte hard disks. The options which will be available include slave Z80 processor cards, and 16 bit cards. You have a choice of MINOS and OASIS as operating systems apart from CPM.
SOFTWARE: CPM plus compatibility with the North Star Horizon Software.

Oscar	£2560	Business	64K	No	Yes	Most	RS-232	IDS 0908-313997

COMMENT: Another business micro system complete with twin 5¼" floppy disk drives and a 12" monitor providing an 80 column display. Provision for using additional disk capacity for more data storage.

Olympia Boss	£2645	Business	64K	No	Yes	Most	Parallel	Olympia 01-262-6788

COMMENT: From the business equipment manufacturer Olympia, the Boss is their first real micro computer system. With a full typewriter style keyboard and 12" monitor showing an 80 column x 28 line display, the Boss has a fairly standard specification loading programs from a 5¼" floppy disk drive. There is provision for adding a hard disk when required.

DEC Professional 325	£2677	Business Education	256K	Extra	No	Most	RS-232	Digital Equipment 0256-59200

COMMENT: Three piece professional system compatible with the mainframe PDP-11/23 series. Supplied complete with 12" monochrome monitor and dual 5¼" double density floppy disk drives. Bit mapped graphics.
SOFTWARE: As the PDP-11/23 is popular, both DEC and independents are converting programs for use with this micro.

TRS-80 Model 11	£2699	Business Education	64K	No	No	Basic	RS-232	Tandy 0922-648181

COMMENT: Desktop machine with single 8" drive and 12" monitor. He-res graphics option £399.
SOFTWARE: Vast range of programs of all types, in line with the TRS-80 being the largest selling micro until the ZX81 came along.

ITT 3030	£2700	Business Education	64-256K	Extra	Yes	Most	RS-232 1EEE 488	ITT 0268-3040

COMMENT: Three part system with the twin disk drives (560 bytes). Provision for using IBM format 8" disks and hard disks. Provision for various character set, 16 colours in graphics mode, background colour and hi-res graphics.
SOFTWARE: CPM plus ITT's own range of business software.

Sharp PC3201	£2750	Business	64K	No	Extra	Basic	Other	Sharp 061-205-2333

COMMENT: Unlike most micros, this is supplied as a complete system including the monitor, disk drives and a printer. Plus an electronic spreadsheet. So you really can plug-in and use the system as soon as its on your premises. The 12" green screen monitor produces an 80 character display including graphics. The printer is marked Sharp, but bears a very close family resemblance to the Epson MX80 range.
SOFTWARE: There are over 70 business programs covering most of the popular subjects plus specialised programs for the wholsesale fruit market, coin machine accounting, farmers payroll, insurance broking and surveyors. With the addition of CPM, another 2000 packages are available from Wordstar to the most sophisticated and specialised programs.

Toshiba T-100	£2750	Business	64K	Yes	Yes	Most	RS-232	Office International Sunbury 85666

COMMENT: Complete system including a colour monitor and 80 column printer. Typewriter style keyboard with numeric keypad and special function keys. Colour monitor producing 80 characters by 25 lines or 36 characters by 24 line display. In other modes provides graphics and text 160 x 100 and 640 x 200 pixels. Dual disk drives each 254K formatted. 80 column dot matrix printer including graphics facility included in the outfit price.
SOFTWARE: Use of CPM as the operating system assures a wide range of packages for most users.

NAME	PRICE	USE	RAM	COLOUR	CPM	LANGUAGE	INTERFACE	SUPPLIER
Torch	£2795	Business	96K	Yes	Com-patible	Most	RS-232	Torch Computers 0223 -841000

COMMENT: Monitor shows colour display plus wide range of graphics facilities. Twin 5¼" disk drives, double density. Combination of 6502 and Z80 processors for flexibility. Handles communications via Teletext, dial up, telex, Econet and the RS-232 as standard. The basic board from the BBC micro forms the base for the Torch micro, plus all the added features making an extremely advanced micro especially for sending information locally or worldwide. A complete screen of information can be sent in ten seconds. Plus hard disk options.
SOFTWARE: CPM plus Torchcalc, electronic mailing, secretary's aid and integrated accounting packages. Edword is Torch's new word processing package integrated with the communications software. It enables letters to be typed, corrected, edited and then automatically sent along a dial-up line to its destination. True electronic mail.

Samurai	£2795	Business	128K-1MB	No	CPM86	Basic, Cobol Fortran	RS-232C	Micro Networks 01-839 3701

COMMENT: Single piece of business micro using the 8086 chip having a 12" monitor with 80 column screen display, twin 8" floppy disk drives, double sided, double density. Typewriter style keyboard, detachable with numeric keypad.
SOFTWARE: There's an increasing amount of programs for micros using CPM86 and MSDOS.

Columbia	£2800	Business Education	128K-IBM	No Extra	CPM86	Most	RS-232C	Icarus 01-485 5574

COMMENT: A 16 bit machine looking just like an IBM Personal Computer, with full compatibility of IBM PC Software and hardware. 12" green screen monitor, twin 320K 5¼" floppy disks and Winchester hard disk interface. IBM compatible keyboard with 83 keys, full numeric pad and 10 special function keys.
SOFTWARE: CPM 86, the latest version of the popular operating system already has Micromodeller, Supercalc, Wordstar, Spellstar and Mailmerge. The software for the IBM Personal Computer is compatible with the Columbia. Plus the Pulsar range of business programs which cover sales and purchase ledger, analysis and product management reports plus nominal ledger.

Compucase	£2800	Business	64K	No	Yes	Most	RS-232	Advanced Software Technology 01-330-0764

COMMENT: Compucase must be an abbreviation for computer in a case. Using gas plasma technology, the Compucase has twin 8085 processors and 8Mbytes of disk storage. Typewriter style keyboard and built-in monitor with display 40 characters by 12 lines, housed in the lid. The system is completed by an 80 column printer. All housed in a briefcase measuring just 13 x 18 x 5.5".
SOFTWARE: Use of CPM as the operating system assures a wide range of packages for most requirements.

Hitachi MB 16001	£2800-£3500	Business	128-384K	Yes	No	Basic, Cobol Fortran, Pascal Assembler	RS-232C	Hitachi 01-848-8787

COMMENT: 16 bit business micro using the 8088 chip which is unusual as its fitted with a colour monitor as standard. Detachable typewriter style keyboard with numeric keypad and special function keys. Large capacity video RAM provides 640 x 400 dot graphic resolution in 8 colours. Text and graphics can be overlaid. Twin 5¼" floppy disk drives, double sided, double density. t slots for expansion.
SOFTWARE: An increasing amount of well known packages are available under MS-DOS.

Fox	£2900	Business	64K	No	Yes	Most	RS-232	Digital Micro Systems 0734-343885

COMMENT: Single unit micro, with integral 9" monitor and twin 5¼" floppy disks (1.2Mbytes). Can work as workstation in an area network.
SOFTWARE: CPM compatible so range of programs available.

Tycom 12 Microframe	£2900	Business	128K	Extra	Extra	Most	RS-232	Tycom Corporation 01-583-2255

COMMENT: British built micro claimed to be future proof due to use of VBC — Versatile Base Bus Concept, where the computer processor is not considered to be the centre of a system — but like a peripheral like a disk drive. So extra processors can be plugged in including their extra memory space and operating systems. The System 12 has its own VRTX executive operating system and 128K of RAM. The twin 5¼" floppy disk drives each have a 600K capacity or 1 floppy and a Winchester hard disk. Typewriter style keyboard with special function keys and numeric keypad. Extra boards available for Z80 processors and 6800 processor. The Model 12 uses the 8088 processor.
SOFTWARE: With the choice of processor there should always be a wide selection of packages available for the Tycom range.

Orion	£2950	Business	128-896K	Extra	Yes	MBasic, CIS Cobol MS-Pascal CBasic, RM Cobol MS Fortran	RS-232C	Office & Electronic Machines 01-407-3191

COMMENT: Using the true 8086 16 bit chip, the Orion is one of an increasing number of British made 16 bit micros. Three separate components with the 12" green screen monitor, 96 key QWERTY keyboard with 6 cursor keys and numeric keypad. Supplied with twin 5¼" floppy disk drives 500K each, double sided floppies available, also 6 and 12 Mbyte Winchester hard disks. Provision for local area networking, Viewdata, dialog micro to micro and telex.
SOFTWARE: Using EOS/C/M which is compatible to CPM-86 and MPM 86 there's an increasing amount of software available. OEM Orion programs are available for word processing, micro to micro file transfer, telex and Prestel. In addition the range of Peachtree programs for business management and basic accountancy are also available.

Stratos	£2950	Business	64K	No	Yes	Most	RS-232	Phoenix Systems 061-440 0739

COMMENT: The Strtos is a business system which comprises a 12" monitor, twin double sided, double density 8" disk drives and a typewriter style keyboard which has a separate numeric keypad. The VDU is the ADDS Viewpoint with detachable keyboard. Disk capacity 2Mbytes. Provision for multi-user x capacity up to 16 on-line users.
SOFTWARE: Use of CPM 2.2 assures a wide range of programs for the Stratos including specialised packages from Phoenix Systems.

Equinox 5000SX & 8000SX range	£2950-£4250	Business Education 64K	No	Yes	Most	Other		Equinox 01-739 2387

COMMENT: System selected by the government computer advisory service for use in government departments. Highly expandable. The 5000SX is the single user system using double density, double sided 5¼" disk drives and the Viewpoint VDU. The 8000SX is the multi-user version of this Equinox system.
SOFTWARE: CPM offers a wide range of programs including Wordstar. There is also DOS available which lets you load programs faster and also process filer quicker.

NAME	PRICE	USE	RAM	COLOUR	CPM	LANGUAGE	INTERFACE	SUPPLIER
Vector V4 20/30	£2995-£3995	Business	128-256K	Yes	Yes	Most	RS-232	Almarc Data Systems 0602-52657

COMMENT: The Vector V4 is an 8/16 bit computer using the Z80 and 8088 chips. You have the advantage of both systems with the facility of upgrading without any additional hardware cost. Colour available using external monitor. Programmable sound generator can be controlled by application programs. The /30 replaces one of the 5¼" floppy disk drives with a 5Mbyte hard disk.
SOFTWARE: Use of the 8 and 16 bit chips plus CPM offers wide choice of programs.

£3,000-£3,999

NAME	PRICE	USE	RAM	COLOUR	CPM	LANGUAGE	INTERFACE	SUPPLIER
ADS System 42	£3000	Business	48K	No	No	Basic	RS-422	Ads 01-947 4881

COMMENT: A retail orientated business micro that incorporates a 5" green screen monitor. Monitor shows a display 40 columns by 8 lines. Uses 5¼" floppy disk drive and provision for using cassettes at 9600 Baud.
SOFTWARE: Supplied complete with a software system for stock control, in retail business. The ADS uses the Holland Automation operating system.

Dot	£3000	Business	Up to 700K	No	Extra	Choice, inc Basic, Fortran Pascal, Cobol	RS-232	Transdata 01-403-5115

COMMENT: A portable micro claimed to be IBM PC compatible using the same processor, the 8088. Twin 3¼" Sony floppy disk drives 5 x 9" monitor. Typewriter style keyboard with numeric keypad and special function keys. Built-in thermal printer, dot matrix type up to 132 column display at 160 c.p.s. Options available to use Dot as on-line terminal.
SOFTWARE: An increasing amount of software is becoming available under MS-DOS — however the 3½" disk still is uncommon — though destined to be the new standard according to certain industry experts.

BMC Oki 1f	£3150-£3600	Business	Up to 256K	Yes	Yes	Most	RS-232	Encotel Systems 01-686-9687

COMMENT: All-in-one micro combining the colour monitor, keyboard, disk drives and a printer in a single unit. Version also available with 10Mbyte hard disk built-in.
SOFTWARE: Uses CPM, so ample programs available including Wordstar.

Eagle 1600	£3150	Business	128-512K	Extra	Yes 86	Most	RS-232	Mediatech 01-903-4372

COMMENT: The Eagle 1600 is an IBM lookalike that uses the true 8086 chip, rather than the 8088 fitted to the IBM PC. Using twin 5¼" double sided, double density disk drives with a capacity of 1Mbyte each unformatted and 784K formatted. Typewriter style keyboard with sculpted design, 105 keys with full numeric keyset and 24 user definable keys. Plus HELP facility which works with the two software packages supplied. 12" green screen monitor producing 80 characters by 25 line display. Video/graphics controller provides full IBM character set plus a 720 x 352 pixels graphics mode. Selectable communications rates from 75-9600 baud. Provision for local area networking up to 64 stations. 8 expansion slots.
SOFTWARE: The Eagle 1600 is supplied complete with two packages, Eaglewriter — a word processing program and Eagle Calc an electronic spreadsheet. As both MS-DOS and CPM86 are supplied, there's an ample range of programs available including ones for the IBM PC.

Vector Series 801	£3255	Business	64K	No	Yes	Most	RS-232	Almarc Data Systems 0602-52657

COMMENT: Single user system in three basic parts: monitor 12" keyboard with numeric keypad and twin floppy disk drives (1.6Mbyte).

Positron 9000	£3256	Business	64K-0.5MB	No	No	Most	RS-232	Positron Computers

COMMENT: Comprises keyboard and numeric keypad, 80 column monitor, 760K floppy disk drive and Epson MX80 printer. Provision to receive pages direct from Prestel. To quote Positron "It's an information handling machine rather than a normal data processing machine". Hard disks are available and up to 4 can be used.
SOFTWARE: The Peachtree range of software will be available plus Styleograph II (word processor) and RMS Database and Dynacaic.

Sord M223/Mk III	£3285	Business	64K	No	No	Most	RS-232C	Sord 01-930 4214

COMMENT: Includes 12" monitor and twin 5¼" floppy disk drives (350K) plus keyboard with numeric keypad.
SOFTWARE: Currently no packages have been specifically announced for the Sort, however using PIPS it is claimed you can write your own.

Panasonic 800 range	£3300-£4350	Business	64K	No	Yes	Most	IEEE 488 RS-232	Panasonic Slough 75841

COMMENT: Two desktop micros both using twin 8" floppy disk drives and typewriter style keyboards. While the 800M is a single piece unit, the 850 has a separate keyboard. Optional hard disk available for the 850 which also has tape back-up.
SOFTWARE: Wide range of programs under the CPM system including Wordstar. There's also a range from CAP-CPP micro-products, The Computer Company, IAL Gemini and CPS Data Systems. There are also specialised programs for dentists, doctors and hotel accounting.

DEC Prof 350	£3348	Business, Education	256K	Extra	No	Most	RS-232	Digital Equipment 0256-59200

COMMENT: Top of the range DEC micro with 12" monitor, showing 80-132 characters, plus twin 5¼" floppy disk drives and optional hard disks. Bit mapped graphics. Compatible with the PDP-11/23 mini computer.
SOFTWARE: As the PDP 11/23 range is popular both DEC and independent suppliers are producing or converting software for this micro.

Comart CP1000	£3395-£4395	Business	Up to 1Mbyte	No	CPM86	Most	RS-232	Comart 0480-215005

COMMENT: The CP1000 is a true 16 bit micro using the Intel 8086 chip. Choice of storage systems from twin 5¼" floppy disks with 390K capacity up to 20Mbytes with the 5" integral Winchester fitted to the CP1520.
SOFTWARE: Increasing amount of packages available using CPM86 — CP1000 also can use the MP/M86 and MS-DOS increasing the amount of programs available.

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NAME	PRICE	USE	RAM	COLOUR	CPM	LANGUAGE	INTERFACE	SUPPLIER
Signet 211	£3435	Business Education	64K	No	Yes	Most	RS-232C	Micro APL 01-834 2687

COMMENT: Compact machine using two disk drives, one 12Mbyte Winchester hard disk and one 5¼" floppy disk. Keyboard and monitor extra.
SOFTWARE: CPM plus the programs available for the Signet 202S.

Almar Series 1605	£3495	Business	128-1Mbyte	No	Yes	Most	RS-232	Almarc 0602-52657

COMMENT: 16 bit computer using 8086 chip featuring 5Mbyte Rodime Winchester hard disk and 800K 5¼" floppy disk system. 8087 maths processor and 8089 DMA available. Expansion up to 15 slots with the S100 motherboard. Real time clock. Multi-user and networking available. Winchester disk controller supports up to 4 Winchesters in one system. On site maintenance available. 8 bit option available as extra.
SOFTWARE: Full range of commercial, industrial and scientific programs available from Almarc plus the increasing number of packages available under MS-DOS and CPM86.

YD 8110	£3500-£3900	Business	128-256K	No	CPM86	Most	RS-232C	Wilkes 0272-25921

COMMENT: Twin 8" floppy disks (1.2Mbyte) with IBM format. Uses the 16 bit 8086 chip with compatibility to use CPM packages. Hi-res graphics. Version with 256K RAM meant as basis of multi-user system costing £3900.
SOFTWARE: Compativility with CPM and CPM86 opens the door to choice from Wordstar to specialised programs.

TRS-80 Model 16	£3599-£4199	Business	128-512K	No	No	Most	RS-232	Tandy 0922-648181

COMMENT: A dual 8/16 bit micro. Single hard disk for multi-user software or two floppy disk drive version. Can be extended up to 3 or 4 disks. Built-in monitor.
SOFTWARE: You can use current TRS-80 model II programs. 16 bit and multi-user programs promised soon.

Iona	£3600	Business	64K	Yes	Yes	Basic Forth	RS-232C	10 Technology 01-248 4876

COMMENT: The Iona is the only micro supplied as a complete outfit that includes a colour monitor and colour printer. It also includes twin 5¼" disk drives. The monitor supplied as part of the outfit has a 14" screen and there are full graphics facilities. Cassette loading of programs is provided if required. The Iona keyboard has a separate numeric keypad and 15 special function keys. While the printer operates at 125 characters per second and works in seven colours. First seen at the PCW show, the Iona can also be turned into a telephone dialler for connecting to Prestel and the phone network.
SOFTWARE: CPM offers a choice of around 2000 plus programs covering all possible applications. Plus a new range of software from Iona which will cover sales ledger, purchase ledger, general ledger, stock control, payroll, word processing and financial modelling.

Kontron P5180	£3700	Business	64K	No	No	Most	RS-232	Kontron Watford 45991

COMMENT: This business micro has it own 9" monitor producing an 80 column display and a typewriter style keyboard with special function keys and a numeric keypad. The keyboard is detachable. High resolution graphics facility with optional colour graphics expansion. 5¼" floppy disk drive with provision to add up to four more and the possibility of using a Winchester hard disk.
SOFTWARE: Specialised range available.

Kalamazoo 1000	£3750	Business	48K	No	No	Most	RS-*32	Kalamazoo 021-475 2191

COMMENT: Four part system, 12" monitor, twin double sided, double density 5¼" disk drives (500K), keyboard and dot matrix printer.
SOFTWARE: Available for most business applications plus specialised trade packages for the motor trade, construction industry and hotels.

Rair Black Box 3/30 series	£3750-£4500	Business Education	64K	No	Yes	Most	RS-232C IEEE 488	Rair 01-836 6921

COMMENT: The Black Box uses an ingenious combination of a 5¼" hard disk for data storage plus a mini-floppy disk for back up and transferring data. The hard disk is 6Mbyte and the floppy disk 500K. This system uses the CPM and you need a monitor to complete the configuration. The 3/30A is single user and the 3/30B a two tier system.
SOFTWARE: Apart from the range of programs available on CPM, Rair have a range of compilers and assemblers available.

Kemitron K3000E	£3795	Business	64K	No	Yes	Most	Other	Kemitron 0244-21817

COMMENT: A micro system that can be linked in with up to four screens and printers. With twin 8" floppy disk drives and 12" monitor.

Nokia Frend	£3,999	Business	128-768K	No	No	Most	RS-232	Nokia UK Ltd 01-900-0421

COMMENT: The first Finnish micro-computer to become available in the UK. Using the Intel 80186 processor, the Frend can be expanded from a stand alone workstation to a multi-user system with the Nokia loca area network and up to 32 extra workstations. Floppy disk drives have 320K capacity and hard disks from 5-15Mbytes are available. The monitor is adjustable and has a 15" screen. The display is black characters on a white background. Standard typewriter keyboard with separate numeric keypad and special function keys. Five expansion slots available for CRT controller and mass memory controller boards. The system comes complete with printer.
SOFTWARE: Using MS-DOS as the operating system there's an increasing range of programs available plus the range available from Nokia.

£4,000-£5,000

NAME	PRICE	USE	RAM	COLOUR	CPM	LANGUAGE	INTERFACE	SUPPLIER
SWTP	£4000 upwards	Business	64-128K	No	No	Choice	RS-232	SWTP 0733-234433

COMMENT: A single piece of business micro that has a 12" green screen monitor and 80 column display. Numeric function keys. High resolution graphics facility. 5¼" floppy disk drive, options include 8" floppy disk and Winchester hard disk systems. Multi-user options available.
SOFTWARE: Wide range of specialist packages available through the range of SWTP distributors in the UK.

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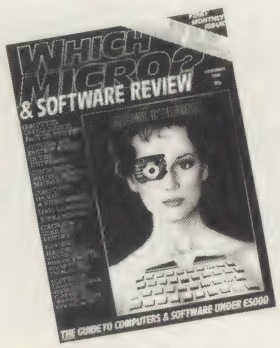

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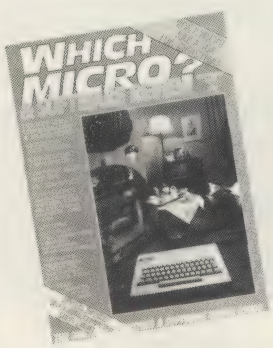

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NAME	PRICE	USE	RAM	COLOUR	CPM	LANGUAGE	INTERFACE	SUPPLIER
Corvus Concept	£4250	Business	256K	No	Yes	Pascal, Fortran	RS-232C	Keen Computers 01-236 5682

COMMENT: 16 bit micro with unique bi-directional screen measuring 11 x 8½". Whole page being typed can be seen, when used for word processing. graphics facility and unusual type fonts can be displayed. Built-in Omninet interface so that extra work stations can be added just by connecting a twist-pair cable. Optional hard disks from 5.7 to 19.7 Mbytes for increased capacity.
SOFTWARE: CPM plus specialist business packages. Edword — a powerful word processor, Corvus Logicalc — an electronic spreadsheet. New Corvus software for launch in 1983 includes electronic mail, business graphics and a database manager.

Equinox Series 8000SX	£4250	Business Education	64K	No	Yes	Most	Other	Equinox 01-739 2387

COMMENT: Multi-user version of 5000SX. Uses the dual 8" double sided, disk drives. Selected by the government computer advisory service.
SOFTWARE: CPM plus Turbo-DOS to increase program loading and file processing speeds by up to five times.

Multicomputer 210	£4250	Business	64K	No	Yes	Most	RS-232C	Multicomputer 01-568 5272

COMMENT: Multi-user system expandable to 255 users. Hard disk (10Mbyte) plus 8" floppy disk. Monitor and keyboard extra.
SOFTWARE: Compatibility with CPM using the nStar system and wide range of specialised application programs.

Vector Series 803/12	£4275-£4995	Business	64K	No	Yes	Most	RS-232	Almarc Data Systems 0602-52657

COMMENT: This range has combination of hard and floppy disk drive systems. The 803 has a 3Mbyte hard disk with an 0.8Mbyte floppy disk at £4275. Top of the range the 812 with 12Mbyte hard disk and 0.8Mbyte.

Caltext 4/4A	£4457-£4657	Business	64-256K	No	Yes	Most	RS-232C	Computer Ancillaries Egham 36455

COMMENT: Includes 5¼" Winchester hard disk (15Mbytes) and 12" screen. Provision for link-up with IBM mainframe.

Cromenco System 3	£4495	Business Education	64-512K	Yes	Compatible	Most	RS-232	Comart 0480-215005

COMMENT: Twin 8" floppy disk drives (1.2Mbytes) and extensive colour graphics giving 4096 shades.
SOFTWARE: CPM plus packages from Comart covering — Database, word processing, invoicing, payroll etc.

PBM 1000	£4500	Business	80K	No	Yes	Most	RS-232C	Terodec 0734-664343

COMMENT: Uses 5¼" Winchester hard disk and 5¼" floppy disk drives with separate bit-slice processor controls both disk drives so that 70% of the main processor is available for the Winchester disk transfer and 97% for the floppy disk transfers.
SOFTWARE: Using CPM wide choice of programs available including Wordstar. Especially as uses enhanced version of CPM.

Sord M223/V	£4795	Business	64K	No	No	Most	RS-232C	Sord 01-930 4214

COMMENT: Three part business system comprising 12" monitor, twin 8" floppy disk drives.
SOFTWARE: Not CPM but Sord claim packages easy to write using PIPS program generator.

Fortune System 2	£4950	Business	256K	Yes	No	Basic Cobol Fortran Pascal CBasic	RS-232C IEEE 488	Fortune 01-631 3383

COMMENT: A 16 bit super micro with 32 bit architecture, extremely similar to the Wang word processor. It is claimed up to 16 terminals can be used and the Unix operating system. Supplied complete with 2x800K 5¼" disk drives.
SOFTWARE: Database management and word processing but no CPM just Unix. Also available is Multiplan Business Accounting System — fully integrated single entry.

Wicat 150	£4995	Business	Up to 1.5Mb	Extra	Emulator	Most	RS-232C	Software Sciences 0252-544321

COMMENT: Single piece business micro using the Motorola 68000 16 bit processor having the monitor built-in plus twin 5¼" disk drives. Full typewriter style keyboard with numeric keypad. Operating systems UNIX, MCS, the CPM emulator and COS68000. 80 column display on the 12" monitor with high resolution graphics facilities available. Provision for video disk interface. Provision for extra Winchester hard disk systems, and a tape streamer back-up. Provision for local networking including IBM 2780, 3270 and 3780 protocols.
SOFTWARE: The progrms available include financial modelling, word processing, sales order processing, stock control and accounting.

Durango F85	£4995	Business	65.5K	No	No	Star Basic	RS-232C	Computer Ancillaries Egham 36455

COMMENT: The Durango incorporates the Micro Winchester technology with an integrated fixed disk for increased storage capability. The four elements in the system, keyboard, video display, disk drives and printer are integrated into a low profile package. The 9" screen of the monitor shows an 80 column display. Durango are one of the few brands to provide a complete outfit including the printer for a single price, something other companies should consider. A feature of all Durangos is the multi-tasking facility for better value from the system.
SOFTWARE: Star Basic is used by the Durango, with the Durango Executive operating system for initialising and housekeeping.

Sundance	£4999	Business	64K	No	Yes	Most	RS-232 RS-422	Keen Computers 01-236 5682

COMMENT: Single unit business micro that has built-in 6Mbyte Winchester hard disk and 10Mbyte cartridge tape back-up and program load. 12" non glare green phoshor monitor providing 80 column x 24 lines or 132 character display. Typewriter style keyboard with 67 sculptured keys, 18 key auxiliary numeric keypad with four programmable function keys. Keyboard detachable with 1.9m coiled cord connection.

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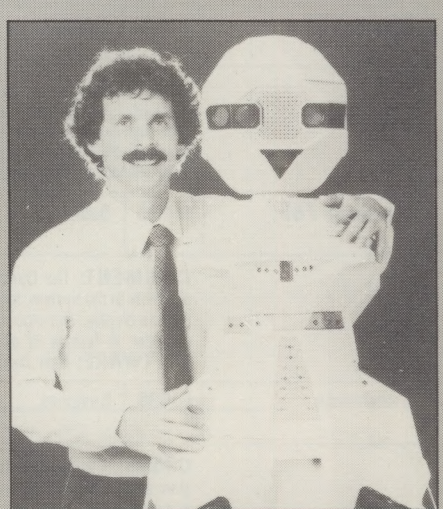

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